Evaluation of Sorbent Injection for Mercury Control

Topical Report for
AEP's Conesville Station Unit 6
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ABSTRACT

The power industry in the U.S. is faced with meeting state imposed regulations, as well as expected federal legislation, to reduce the emissions of mercury compounds from coal-fired plants. Regulations are directed at the existing fleet of nearly 1,100 boilers. These plants are relatively old with an average age of over 40 years. Although most of these units are capable of operating for many additional years, there is a desire to minimize large capital expenditures because of the reduced (and unknown) remaining life of the plant to amortize the project. Injecting a sorbent such as powdered activated carbon into the flue gas represents one of the simplest and most mature approaches to controlling mercury emissions from coal-fired boilers.

This is the final site report for tests conducted at AEP Conesville Power Plant, one of six sites evaluated in this DOE/NETL program. The overall objective of the test program is to evaluate the capabilities of activated carbon injection at six plants that, combined, have configurations that together represent 78% of the existing coal-fired generation plants:

- Sunflower Electric’s Holcomb Station Unit 1
- AmerenUE’s Meramec Station Unit 2
- Missouri Basin Power Project’s Laramie River Station Unit 3
- Detroit Edison’s Monroe Power Plant Unit 4
- AEP’s Conesville Station Unit 6
- Ameren’s Labadie Power Plant Unit 2

The goals for this Phase II program established by DOE/NETL are to reduce the uncontrolled mercury emissions by 50 to 70% at a cost 25 to 50% lower than the target established of $60,000/lb mercury removed. The results from Conesville indicate that sorbent injection alone in a high-sulfur flue gas is not capable of achieving the targeted mercury removal rates at a reduced cost. Injection of DARCO® E-12, the best performing sorbent in full-scale injection tests, at 12 lbs/MMacf, resulted in a mercury removal a rate of 31% at a cost of $13,600/lb of mercury removed.

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INTRODUCTION

On March 15, 2005, the EPA announced that it would reduce mercury emissions from coal-fired power plants through the Clean Air Mercury Rule (CAMR). By early March 2007, twelve states had regulations in place that were more stringent than the Clean Air Mercury Rule (CAMR), either requiring greater reductions in emissions or earlier control implementation. Thirteen additional states are considering similar regulations that are more stringent than the CAMR. These regulations are requiring the industry to respond quickly to meet the implementation schedules. As of late 2007, mercury control systems were ordered for 73 units. On February 8, 2008, the U.S. Court of Appeals for the District of Columbia vacated CAMR, removing any federal regulations that require monitoring or control of mercury from electric generating units, although it is expected that new, possibly more stringent regulations will be implemented in the near future. State and federal regulations will affect both new plants and the existing fleet of nearly 1,100 boilers in the United States. The existing plants are relatively old with an average age of over 40 years. Most of these units are capable of operating for many additional years if the capital expenditures associated with retrofitting new pollution controls can be minimized.

ADA-ES, Inc., with support from the Department of Energy's National Energy Technology Laboratory (DOE/NETL) and industry partners, conducted a mercury control demonstration using sorbent injection into the electrostatic precipitator (ESP) at AEP's 400-MW Conesville Station Unit 6. This report presents results from the demonstration including the effect on mercury emissions in a high-sulfur flue gas when 1) injecting sorbent at a unit equipped with a cold-side ESP, 2) using a coal additive to promote mercury oxidation along with sorbent injection, and 3) the use of alkali materials to reduce the interference of SO_3 on mercury capture by the sorbent particles using a sorbent screening device and at full scale.

EXECUTIVE SUMMARY

The primary objective of testing at American Electric Power's (AEP) Conesville 400-MW Station was to determine the cost and effects of sorbent injection for control of mercury in stack emissions from Unit 6. Conesville Unit 6 was chosen for this evaluation because it fires high-sulfur (3–4%) eastern bituminous coal and is equipped with a medium-sized, cold-side ESP (SCA = 301 ft^2/kacfm) for particulate control and a wet flue gas desulfurization (WFGD) system for SO_2 control. General observations and conclusions include:

- Native (baseline) mercury levels and removal:
  - ESP native mercury capture is very low at Conesville, from 0 to 20%. The mercury is 60–70% oxidized at the ESP outlet, upstream of the WFGD, and 90% elemental at the WFGD outlet.
  - Most of the oxidized mercury is removed in the WFGD.
  - Mercury ranges from 13 to 33 lb/TBtu at the ESP.
- Parametric Testing:
  - Most of the eighteen sorbents tested at full-scale increased T/R set spark rates, decreased power levels, and/or impacted opacity.
  - The maximum incremental removal by a sorbent was approximately 31% (DARCO® E-12 at 12 lb/MMacf).
  - The next highest removal was 25% (Sorbent Technologies EXP-2 at 16 lb/MMacf).
  - Both of these sorbents had an opacity impact that would require further evaluation.
  - Several sorbents demonstrated some improvement over the benchmark sorbent, DARCO® Hg.
  - Changing the injection lance design did not improve mercury removal.
  - Injecting the coal additive KNX resulted in a marginal improvement in the mercury removal across the ESP + WFGD from 72% to 76%.
  - Mercury removal using the benchmark sorbent increased from 8% at 9.5 lb/MMacf DARCO® Hg to 15.6% at 8 lb/MMacf DARCO® Hg when injected with the coal additive KNX.
- Options for improving performance:
  - Improved sorbents
  - Control SO_3, possibly with alkali co-injection
  - Inject PAC upstream of APH
- The mercury CEM installed at Conesville demonstrated extended, unattended operation with fairly reliable performance.
- The total mercury from STM tests have compared favorably with CEM measurements. At both the ESP inlet and outlet locations, and on the east and west sides, directly comparable samples are within 10%, with few exceptions.

The challenges identified and characterized at Conesville stemming from the high concentration of SO_3 in the flue gas may represent a larger obstacle to mercury control for the industry than just units that fire high-sulfur coal. The presence of SO_3 in flue gas appears to decrease mercury capture by activated carbon, sometimes dramatically. SO_3 may be present in sufficiently high concentration in several common plant configurations including low-sulfur units using SO_3 for flue gas conditioning and units where an SCR converts sufficient SO_2 to SO_3. Although some sorbents performed better than the benchmark sorbents, DARCO® Hg and DARCO® Hg-LH, in general the sorbents tested at Conesville did not show significant mercury removal. However, the more promising sorbents may perform well in plant configurations with slightly lower SO_2 and/or SO_3 in the flue gas.

A goal of this DOE/NETL program is to achieve 50–70% mercury capture across the ESP. Because this goal was not reached at Conesville, the test team recommended to DOE that testing be continued at another site with lower levels of SO_3. Subsequently, DOE approved testing at Ameren's Labadie Power Plant to determine if some of the sorbents identified at Conesville would be effective at Labadie. Testing at Labadie has been completed and results will be published in U.S. DOE Cooperative Agreement No. DE-FC26-03NT41986 Topical Report No. 41986R25, 2008. Additional testing was also conducted by ADA-ES through DOE contract DE-FC26-06NT4278 at Public Service of New Hampshire's Merrimack Station, a site that fires a low- to medium-sulfur coal and uses an SCR for NO_X control. The SCR at Merrimack converts some of the SO_2 to SO_3 so that the resulting flue-gas SO_3 concentration is typically over 10 ppm.[1]

DESCRIPTION OF OVERALL PROGRAM

This test program is part of a six-site program to obtain the necessary information to assess the feasibility and costs of controlling mercury from coal-fired utility plants. Sorbent injection for mercury control was successfully evaluated in DOE/NETL's Phase I tests at scales up to 150 MW, on plants burning subbituminous and bituminous coals, and with electrostatic precipitators (ESPs) and fabric filters (FFs). During the Phase I project, several issues were identified that needed to be addressed, such as evaluating performance on other plant configurations, optimizing sorbent usage (costs), and gathering longer-term operating data to address concerns about the impact of activated carbon on plant equipment and operations.

The overall objective of this test program is to evaluate the capabilities of activated carbon injection at six plants with configurations that, taken together, represent 78% of the existing coal-fired generation plants in the U.S. A short description of the six host sites is given in Table 1. Table 2 shows the program test schedule.

The technical approach followed during this program allows the team to 1) effectively evaluate activated carbon and other viable sorbents on a variety of coals and plant configurations, and, with the exception of Laramie and Conesville, 2) perform long-term testing at the optimum conditions for at least one month. These technical objectives are accomplished by following the series of tasks listed below. These tasks are repeated for each test site.

1. Host site kickoff meeting, test plan, and sorbent selection
2. Design and installation of site-specific equipment
3. Field tests
4. Data analysis
5. Sample evaluation
6. Economic analysis
7. Reporting and technology transfer

A detailed description of each task is given in Appendix A: Conesville Test Plan.

Table 1. Host Site Key Descriptive Information.

	Holcomb	Meramec	Laramie River	Monroe	Conesville	Labadie
Test Period	3/04–8/04	8/04–11/04	2/05–3/05	3/05–6/05	3/06–5/06	11/06–1/07
Unit	1	2	3	4	6	2
Size (MW)	360	140	550	785	400	630
Test Portion (MWe)	180 and 360	70	140	196	400	630
Coal	PRB	PRB	PRB	PRB/Bituminous Blend	Bituminous	PRB
NO_x Control	First Generation Low-NO_X Burners	Low-NO_X Burners and SOFA	None	SCR	None	LNB, LNCFS Level III, SOFA
Particulate Control	Joy Western Fabric Filter	American Air Filter ESP	ESP	ESP	Research-Cottrell ESP	ESP (three in parallel)
SCA (ft^2/kacfm)	NA	320	599	258	301	279 combined
FGC		None	None	SO_3	None	SO_3
Sulfur Control	Spray Dryer Niro Joy Western	Compliance Coal	Spray Dryer	Compliance Coal	Wet Lime FGD	Compliance Coal
Ash Reuse	Disposal	Sold for Concrete	Disposal	Disposal	FGD Sludge Stabilization	Sold for Concrete
Typical Inlet Hg ($\mu g/dNm^3$)	10–12	10–12	10–12	5–10	15–30	10–12
Typical Native Hg Removal	<15%	<30%	<20%	10–30%	50%	<30%

Table 2. Field-Testing Schedule.

Site	2004			2005				2006				2007			
	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
Holcomb															
Meramec															
Laramie River															
Monroe															
Conesville															
Labadie															

There are more than 100 individual team members from 33 organizations participating in this five-site program. The organizations providing co-funding for tests at Conesville include:

ADA-ES, Inc.
ALSTOM
AmerenUE*
American Electric Power*
Arch Coal
DTE Energy
Dynegy Generation
EPRI
MidAmerican
NORIT Americas Inc.
Ontario Power Generation* and partners
  EPCOR
  Babcock & Wilcox
Southern Company
Tennessee Valley Authority

** Indicates host site.*

Key members of the test team include:

AEP Conesville Power Plant
  Project Managers: Gary Spitznogle and Aimee Toole
  Conesville Project Engineer: Georgeanne Hammond
ADA-ES, Inc.
  Project Manager: Sharon Sjostrom
  Site Manager: Cody Wilson
DOE/NETL
  Project Manager: Andrew O'Palko
EPRI
  Project Manager: Ramsay Chang
Reaction Engineering International
  CFD Modeling, Coal and Byproduct Analysis Interpretation: Connie Senior
Others
  Analytical laboratories

CONESVILLE PROJECT OBJECTIVES AND TECHNICAL APPROACH

The primary objective of testing at American Electric Power's (AEP) Conesville Station, located in Coshocton County, Ohio, was to determine the cost and effectiveness of sorbent injection for control of mercury in stack emissions from the 400-MW Unit 6. This unit typically fires high-sulfur eastern bituminous coal from several local mines, and is equipped with a cold-side ESP for particulate control and a wet flue gas Desulfurization (WFGD) system for SO_2 control. The general technical approach for field-testing followed a series of tasks, as listed below.

1. Sorbent selection and screening
2. Sample and data collection coordination
3. Baseline tests
4. Parametric tests

Parametric test conditions were chosen to meet an overall objective of identifying options to enhance mercury removal for units firing eastern bituminous coal. The evaluation focused on activated carbon injection using sorbents treated with halogens and alkali materials, and non-treated sorbents. Several of the materials tested at Conesville were also tested at the other project host sites. Due to the high-sulfur flue gas at Conesville, many new sorbents, some considered experimental, were evaluated, particularly those designed with additives to minimize the effect of SO_3 on mercury capture. The evaluation was conducted on 50% and 100% of the flue gas stream. Conesville had a fairly complicated arrangement of ducts and turning vanes leading to the ESP. Therefore, sorbent distribution modeling was completed to assure good sorbent distribution into the ESP. Long-term tests were planned at this site, but were not conducted due to the low mercury removal performance.

Importance of Testing at Conesville

Conesville Unit 6 was chosen for this evaluation because it has a marginally sized, cold-side ESP (SCA = 301 ft^2/kacfm), and it fires high-sulfur eastern bituminous coal. High-sulfur flue gases have proven to be a challenge for mercury control via sorbent injection. The configuration at Conesville allowed an evaluation of the effects of sorbent injection on mercury control, ESP performance, and WFGD performance with an ESP that is representative of many units across the industry.

<u>Background: Mercury Removal in High-Sulfur Flue Gas</u>

One of the more difficult applications for mercury control with sorbent injection concerns sites firing high-sulfur bituminous coals. Laboratory studies conducted over the past 15 years by URS Group, UNDEERC, and others indicate that HCl and SO_x in the flue gas can significantly affect the mercury adsorption capacity of fly ash and activated carbon.[2,3] These studies suggest that SO_2 and SO_3 reduce the equilibrium mercury capacity of activated carbon and fly ash because activated carbon tends to catalyze SO_2 to H_2SO_4. In turn, these sulfur compounds occupy surface sites on the carbon that normally are available to adsorb and oxidize mercury. Hence, the mercury adsorption capacity is dependant on the SO_2 and

SO_3 concentration, which is orders of magnitude greater than the mercury concentration. Full-scale field tests also indicate that standard, untreated, activated carbon is less efficient in high-sulfur environments.[4,5]

Activated carbon injection tests were conducted at the University of Illinois' Abbott Power Plant in Champaign, Illinois, in 2001.[4] This site fires high-sulfur (3.8%) bituminous coal with 2500 ppm chlorine. Equilibrium adsorption capacity measurements were conducted for DARCO® Hg at temperatures of 375 and 325 ºF. At 375 ºF, the equilibrium adsorption capacity was 184 µg/g. At 325 ºF, the equilibrium adsorption capacity was 486 µg/g. Injection tests were conducted at two flue gas temperatures, 360 ºF and 330 ºF, and the results showed a slight increase in the mercury removal performance of DARCO® Hg at the lower temperature. Injection tests were also conducted at the Lausche Heating Plant of Ohio University (1000 ppm SO_2 and 20 ppm SO_3 in flue gas). Test results from both Abbott and Lausche, shown in Figure 1, indicate limited mercury removal performance of DARCO® Hg in these environments.[6]

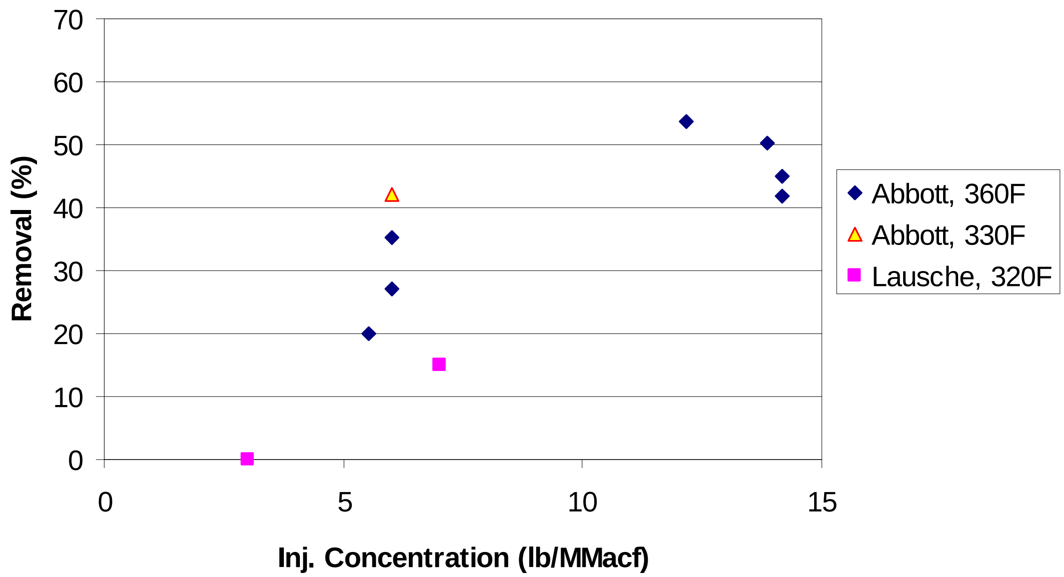


Figure 1. Results of DARCO® Hg Tests at Abbott and Lausche Power Plants.

Equilibrium adsorption capacity measurements were also made at We Energies Pleasant Prairie Power Plant (P4) upstream and downstream of an SO_3 injection system for ESP flue gas conditioning.[7] These data indicate a significant impact on the mercury capacity of DARCO® Hg due to both SO_3 and temperature. Decreasing the temperature from 300 ºF to 250 ºF via water spray cooling did not improve the mercury removal measured across the ESP. This suggests that the threshold capacity (the adsorption capacity at which a change in performance is expected) was less than the equilibrium adsorption capacity measured at 300 ºF (425 µg/g) in the presence of SO_3. The equilibrium data also suggest that the capacity can be significantly improved at higher temperatures in the presence of SO_3 if the sorbent is mixed with an alkali material such as lime to mitigate the effects of SO_3. No improvement was noted at the lower temperature (250 ºF). The P4 and Abbott results are presented in Table 3.

Table 3. Equilibrium Adsorption Capacities for Two Sites with SO_3 in the Flue Gas.

Site	SO_3	Temp. (ºF)	Equilibrium Adsorption Cap. (µg/g) Normalized to 50 µg/Nm^3
P4	Low-Sulfur Coal	250	8823
P4	FGC	250	3355
P4 (DARCO® Hg + Lime*)	FGC	250	2091
P4	Low-Sulfur Coal	300	880
P4	FGC	300	425
P4 (DARCO® Hg + Lime*)	FGC	300	> 1504
Abbott	High-Sulfur Coal	375	148
Abbott	High-Sulfur Coal	325	486

*Lime to sorbent ratio was 60:1.

Conesville Site Description

General Description of Unit 6

Unit 6 is a 400-MW, Combustion Engineering (ALSTOM), tangentially fired, PC unit that normally fires high-sulfur eastern bituminous coal. This unit is equipped with cold-side Research-Cottrell ESPs. Flue gas is drawn through the ESPs via Induced-Draft (ID) fans. Downstream of the ESP and ID fans are two Universal Oil Products wet lime absorber modules (WFGD) for SO_2 removal. The modules have partial bypass capability and have been retrofitted with a Babcock & Wilcox (B&W) tray design. The system is typically operated with the bypass closed. The bypass valves have a design leak rate of 5% of the flow. A sketch of the unit layout is presented in Figure 2. Key operating parameters are shown in Table 4.

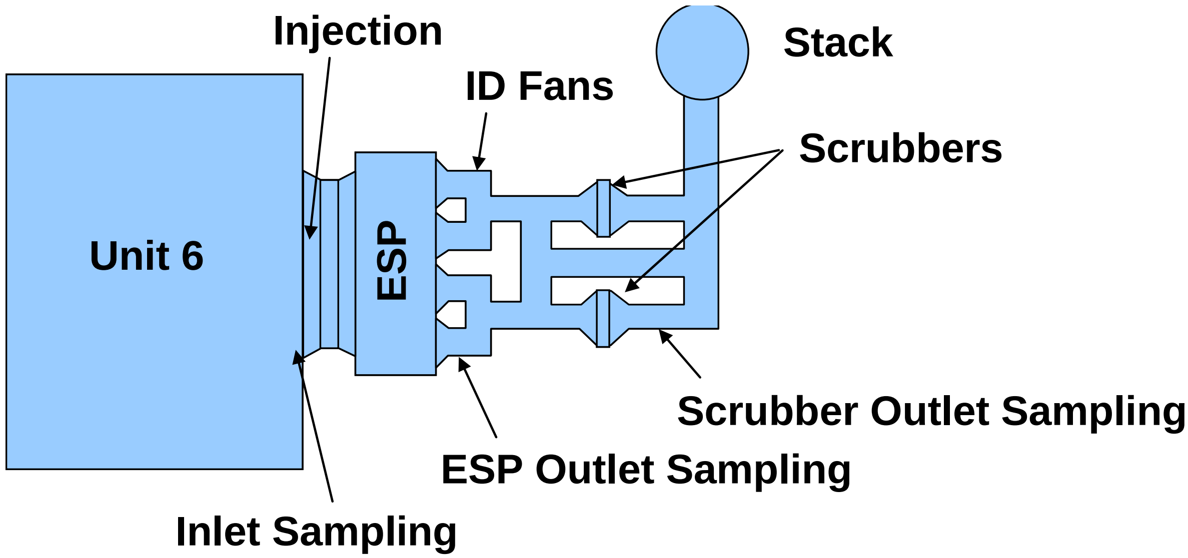


Figure 2. Layout Sketch of Conesville Unit 6.

Table 4. Conesville Key Operating Parameters.

Unit	6
Size (MW)	400
Test Portion (MWe)	200 and 400
Coal	High-Sulfur Ohio Basin Bituminous
Heating Value (as received)	11,020
Sulfur (% by weight)	3.31
Chlorine (ppm dry)	273
Mercury (μg/g)	0.381
Particulate Control	Cold-Side ESP SCA = 301 ft2/kacfm
Sulfur Control	Wet FGD
Ash Reuse	FGD Sludge Stabilization

Sorbent Injection and Mercury Monitoring Locations

The single ESP inlet at Conesville Unit 6 is split among four compartments. Each ESP compartment has eight electrical fields in series and eight hoppers: four front-to-back and two side-to-side. Figure 3 is a sketch of the flue gas path showing designations for the ESP TR sets, ESP hoppers, and various sample and injection ports. During the test program, sorbent was injected upstream of the ESP across either the entire, or across half of the inlet duct to treat either 100% or 50% of the flue gas stream. Mercury measurements were made using continuous emission monitors (CEMs) at the ESP inlet and outlet. Figure 4 is a plan sketch of Unit 6 showing the location of the carbon injection silo, injection location, and CEM locations. See Appendix D for a description of the carbon injection silo and Appendix E for a description of the CEMs.

The temperature across the ESP inlet is stratified due to the air pre-heater design. Temperatures measured in the injection ports indicate a 75 ºF temperature gradient (nominally 290 ºF in Port 2 on the A-Side and 365 ºF in Port 10 B-Side). The flue gas SO_3 concentration is nominally 30 ppm, based upon previous measurements by AEP.

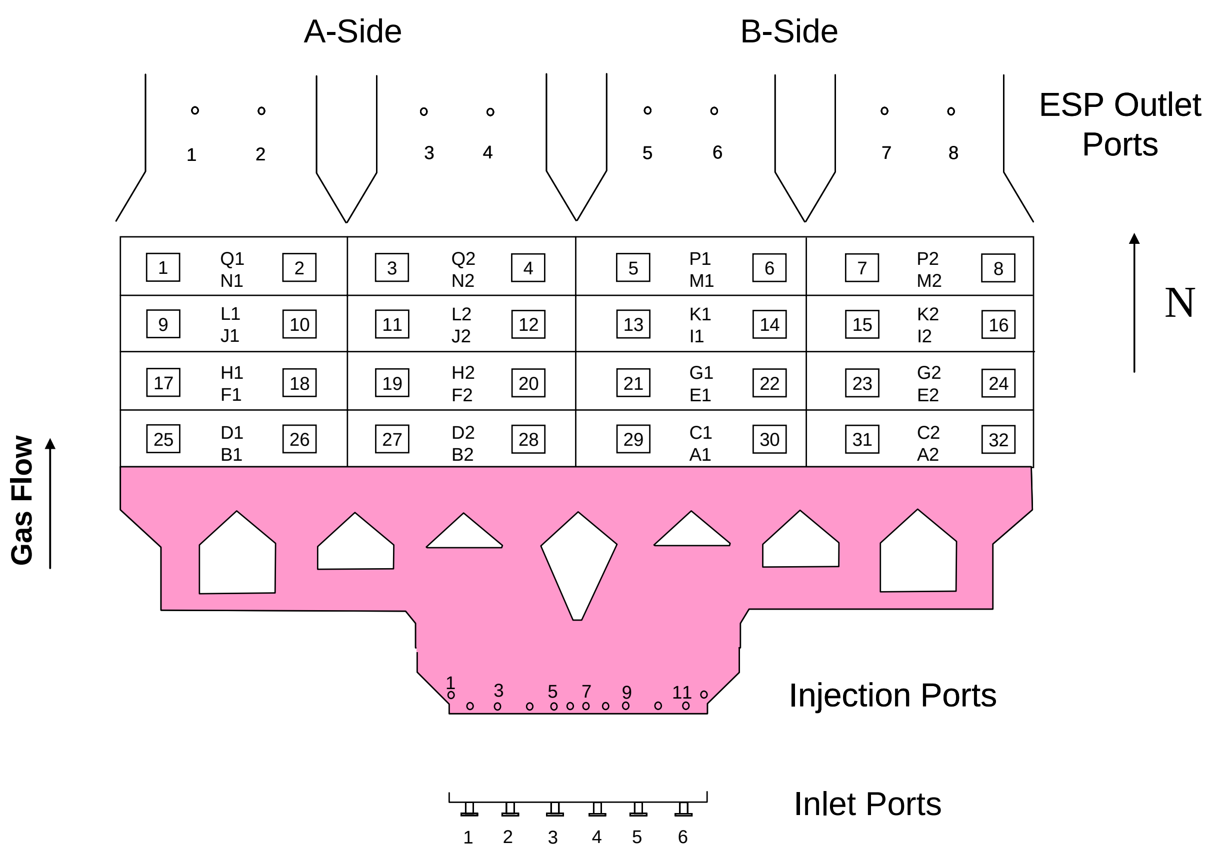


Figure 3. Conesville Unit 6 Testing Layout.

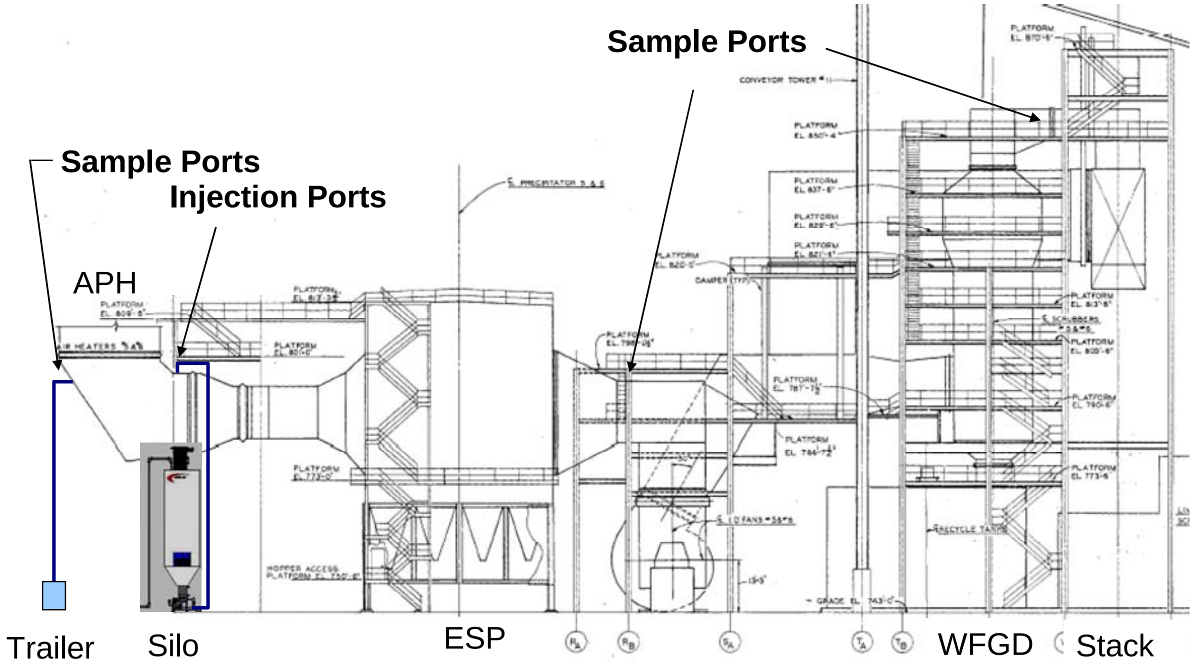


Figure 4. Conesville Unit 6 Sorbent Injection and Mercury Measurement Locations.

Sorbent Trap Equipment and Analysis

The method of using activated carbon traps for measuring mercury at coal-fired power plants has been given several acronyms over the past few years such as Quick SEM or QSEM (EPRI trademark), EPA Method 324 or M324, and, most recently, it was defined in Appendix K of Title 40 CFR Part 75 under the title "Quality Assurance and Operating Procedures for Sorbent Trap Monitoring Systems." For this report, it will be referred to as the Sorbent Trap Method (STM). The method involves inserting a pair of glass tubes filled with activated carbon (know as a trap) into a gas stream and drawing a measured amount of gas across each trap. The paired traps can then be sent to a lab and analyzed for mercury. At Conesville, several different types of STM equipment were used including those from Apex Instruments, Environmental Supply Company (ESC), and a gas metering box designed by ADA-ES. Further details of the STM method and equipment are included in Appendix C.

Injection Lance Arrays

The injection port location affects the distribution of sorbent in the duct and can cause mercury stratification at the ESP outlet. Sorbent distribution modeling was done for Conesville because of complicated duct arrangement and number of turning vanes in the ESP ductwork. Reaction Engineering International (REI) modeled the sorbent distribution using computational fluid dynamics (CFD). These modeling studies were used to design a lance arrangement that would provide good sorbent distribution into the ESP. The model results are presented in more detail later in this report.

Two different sorbent injection lance designs were used at Conesville. The first, used for testing 100% of the unit, consisted of ten multi-nozzle lances installed in injection Ports 2 through 11, as shown in Figure 5. These lances had four nozzles each. The second design, presented in Figure 6, was used for testing 50% of the unit and consisted of ten single-nozzle lances. Two lances were installed in each of Ports 6 through 10 on the B-Side (hot) of the unit.

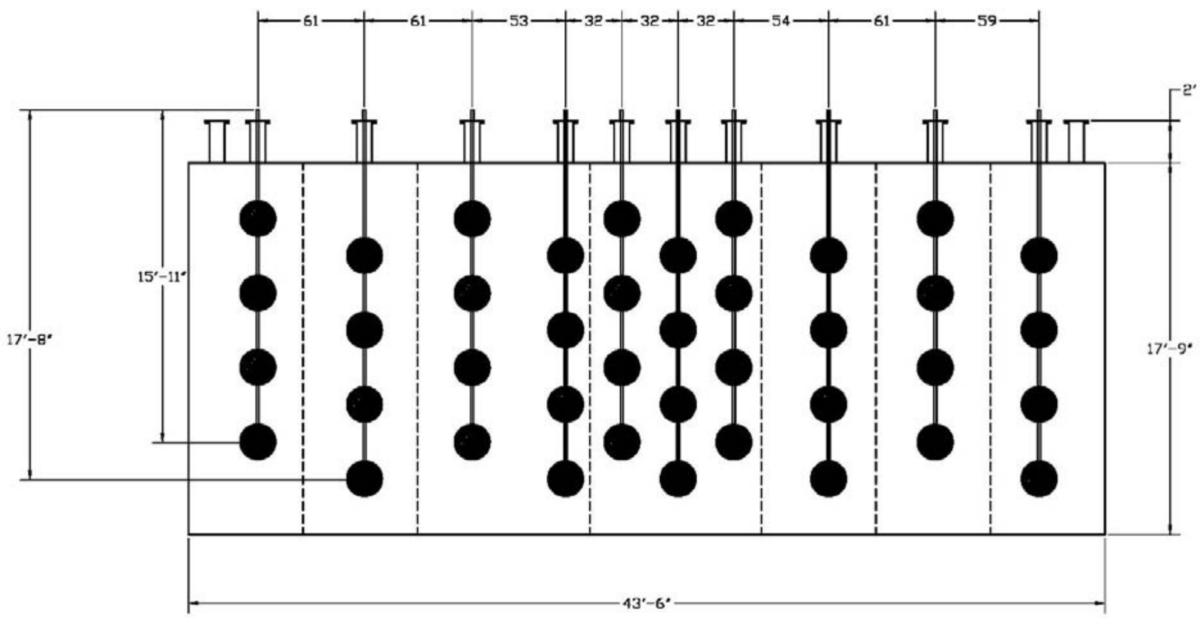


Figure 5. Multi-Nozzle Injection Lance Array.

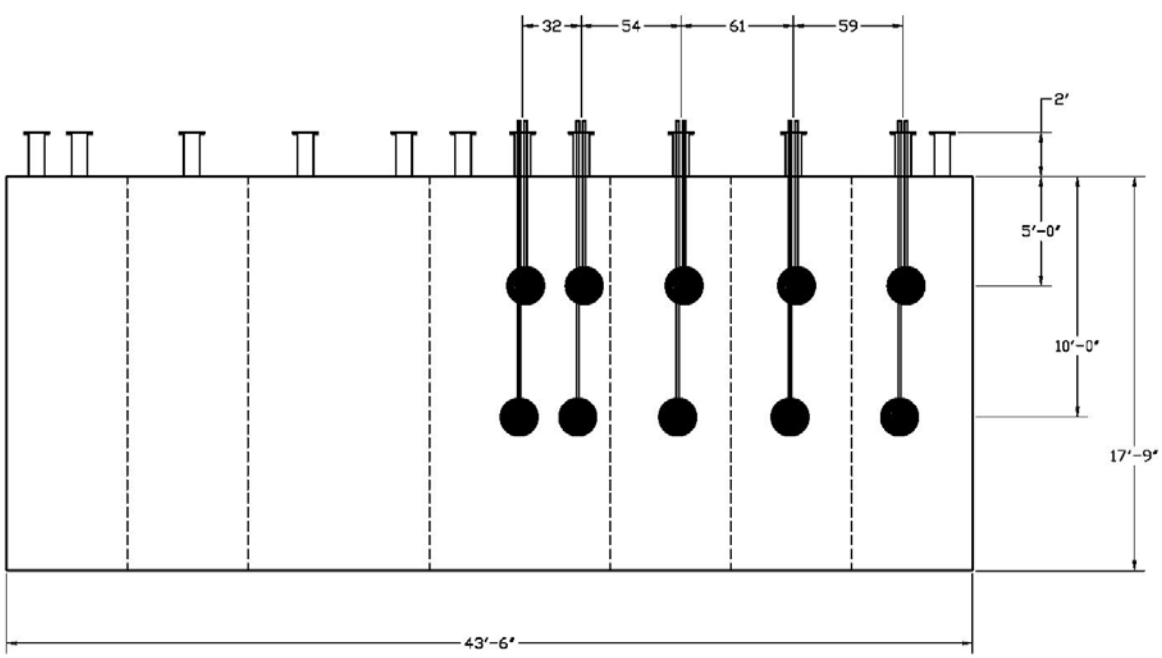


Figure 6. Single-Nozzle Injection Lance Array.

Description of Field-Testing Subtasks

The field tests were accomplished through a series of four subtasks: 1) sorbent selection and screening, 2) sample and data coordination, 3) baseline testing, and 4) parametric testing. The subtasks are independent of each other in that they each have specific goals and tests. However, they are also interdependent because the results from each subtask influenced the test parameters of subsequent subtasks. A fifth subtask, long-term testing, was originally planned, but not done due to the lower-than-expected mercury removal achieved at the site. A summary of each subtask is presented in the following sections. Tests with the Sorbent Screening Device are abbreviated (SSD). The test sequence is presented in Table 5.

Table 5. Full-Scale Test Sequence Conducted at Conesville Unit 6.

Test Description	Date	Parameters/Comments
SSD	11/8/05–11/15/05	SSD using the sorbent screening device to identify potential sorbents for full-scale testing.
SSD	2/6/06–2/10/06	SSD using the sorbent screening device to identify potential sorbents for full-scale testing.
Week 1—Baseline	3/13/06–3/17/06	Day 1 – Test crew set-up; no restrictions on boiler load Day 2 – Baseline Hg CEM Measurements Day 3 – Hg CEM Measurements and Manual Sampling Day 4 – Hg CEM Measurements and Manual Sampling Day 5 – Hg CEM Measurements and Manual Sampling
Week 2—Parametric Sorbent Injection Tests*	3/20/06–3/24/06	Day 1 – Contingency Day 2 – DARCO® Hg and DARCO® Hg-LH Day 3 – DARCO® E12 Day 4 – Donau Desorex DX700C Day 5 – Calgon RUV-N
Week 3—Parametric Sorbent Injection Tests*	3/27/06–3/31/06	Day 1 – Sorbtech EXP-2 Day 2 – DARCO® Hg and DARCO® Hg—Bottom Day 3 – DARCO® E14 Day 4 – DARCO® E15 Day 5 – DARCO® E13
Week 4—Parametric Sorbent Injection Tests*	5/8/06–5/12/06	Day 1 – Test crew set-up; no restrictions on boiler load Day 2 – DARCO® E12 Multi-Nozzle Lance Stratification Test Day 3 – DARCO® E12 Single-Nozzle Lance Stratification Test Day 4 – Analyze Maintenance Day 5 – DARCO® E18 and DARCO® E20
Week 5—Parametric Sorbent Injection Tests* and SSD	5/15/06–5/19/06	Day 1 – DARCO® E19 and Calgon RUV+ Day 2 – EERC C5SL Day 3 – INSUL and Start of SSD Day 4 – SSD Day 5 – Prepare Site for Break
Week 6—SSD, KNX Test	7/05/06–7/13/06	Days 1–5 – SSD: Various Sorbent Combinations Day 7 – KNX, KNX + DARCO® Hg
Week 7—SSD	7/31/06–8/01/06	Days 1–2 – SSD: Various Sorbent Combinations

*Sorbent injection screening tests are short, 2-hour tests that are used to determine if further testing is warranted.

Sorbent Selection and Sorbent Descriptions

One of the keys to a successful program at Conesville was the identification of sorbents that were effective in high-sulfur flue gas. An effective sorbent removes mercury across the ESP and may increase the fraction of oxidized mercury exiting the ESP to make the WFGD more effective. The activated carbon sorbent DARCO® Hg has been tested in various lab-, pilot-, and full-scale mercury control demonstrations, and has been identified for DOE programs as the benchmark for performance comparisons. DARCO® Hg is derived from a Texas lignite coal and manufactured by NORIT Americas. Potential alternative sorbents include those that may be more effective than DARCO® Hg, or sorbents that are as effective but cost less. Forty-six (46) materials were tested at Conesville from 14 different suppliers. The suppliers are included in Table 6.

Table 6. Companies Providing Sorbents for Sorbent Screening Tests.

Supplier	General Description
Advanced Fuel Research	Activated Carbon
Calgon	Activated Carbon
California Earth Minerals	Non-Carbon Based
Donau	Activated Carbon
EERC	Activated Carbon
BASF (Engelhard)	Non-Carbon Based
Frontier Geosciences	Activated Carbon
NEST	Non-Carbon Based
NORIT Americas	Activated Carbon
Sorbent Technologies	Activated Carbon
TDA Research	Non-Carbon Based
Zinkan	Non-Carbon Based
AEP	Alkali Materials
ADA-ES	Blends of sorbents

The original plan included the selection of two sorbents for full-scale evaluation. Candidate sorbents were screened during three test rounds using two different devices designed by ADA-ES. The results from Round 1 testing were found to be corrupted by a cool spot in the sample line that affected the inlet SO_3 and Hg concentrations. The apparatus was modified to eliminate this cool spot and a second round of tests was conducted. However, Round 2 results were also found to be corrupted by other cool zones in the device. Because of the high SO_3 at Conesville, a "cool spot" was considered anything below the flue gas temperature. Maintaining the gas temperature without increasing it and not allowing any areas to drop below the gas temperature proved challenging. Finally, the original device was abandoned for an in-situ design that eliminated any potential for sampling artifacts inherent in the extractive device. Appendix F contains a description of the sorbent screening devices.

A full description of the sorbent screening procedure and test results is presented later in this report. Because of uncertainty regarding the Round 1 results (there was little difference in sorbent performance), the test team modified the original test plan to include several sorbents in full-scale parametric tests.

Based on the results of all sorbent screening tests, many different sorbents were eventually tested at full-scale as listed in Table 7, including the benchmark DARCO® Hg. Prices for commercially available sorbents are also included. The final two materials were added after initial full-scale results showed poor mercury removal performance. Materials submitted by EERC and Frontier Geosciences also demonstrated comparable performance in SSD tests, but were not included in the initial parametric tests because these materials were not available in sufficient quantities.

Table 7. Sorbents Tested at Full-Scale Based on Screening Tests and Availability.

Sorbent	Price/lb (2006 $)
Calgon RUV	
Calgon RUV-N	$0.74
Sorbent Technologies EXP-2	$0.75
Donau Desorex DX700C	$0.42
NORIT DARCO® Hg	$0.45
NORIT DARCO® Hg-LH	$0.85
NORIT DARCO® E-12	
NORIT DARCO® E-13	
NORIT DARCO® E-14	
NORIT DARCO® E-15	
NORIT DARCO® E-18	
NORIT DARCO® E-19	
NORIT DARCO® E-20	
NORIT DARCO® E-25	
NORIT DARCO® E-25c	
NORIT Insul	
EERC C5SL	
10 Trona:1 Hg	
3 Trona:1 Hg	
1 Trona:1 Hg	
10 Lime:1 Hg	

Sample and Data Coordination

Collecting, analyzing, and archiving samples and plant operating data are key aspects of any field test program. A copy of the Sample and Data Management Plan is included in Appendix B. Table 8 presents an example of samples and data collected during testing. Coal samples were collected daily and submitted for analysis. Grab samples of ash were collected from the ESP hoppers each day of testing and analyzed for mercury.

Table 8. Data Collected during Field-Testing.

Parameter	Sample/Signal/Test	Baseline	Parametric
Coal	Batch sample	Yes	Yes
Coal	Plant signals: burn rate (lb/hr) quality (lb/MMBTU, % ash)	Yes	Yes
Fly Ash	Batch sample	Yes	Yes
Unit Operation	Plant signals: boiler load, etc.	Yes	Yes
Temperature	Plant signal at AH inlet and ESP inlet/outlet	Yes	Yes
Temperature	Full traverse at ESP inlet/outlet	Yes	No
Duct Gas Velocity	Full traverse at ESP inlet/outlet	Yes	No
Mercury (total and speciated)	Hg Monitors at ESP inlet/outlet	Yes	Yes
Mercury (total and speciated)	ASTM M6784-02 (Ontario Hydro) at ESP inlet/outlet	Yes (1 set)	No
Mercury (total)	STM	Yes	Yes
Particulate Emissions	EPA Methods 5 and 17	Yes	No
HCl, HF, Br	EPA Method 26a at ESP inlet/outlet	Yes	No
SO_3	Controlled Condensate at ESP inlet	Yes	No
Sorbent Injection Rate	PLC, lbs/min	No	Yes
Plant CEM data (NO_x, O_2, SO_2, CO)	Plant data – stack	Yes	Yes
Stack Opacity	Plant data – stack	Yes	Yes
Pollution Control Equipment	Plant data (Sec mA, Sec. Voltage, Sparks, Scrubber pH, etc.)	Yes	Yes

Baseline Testing (No Sorbent Injection)

One week of baseline testing was completed on March 13–17, 2006. The baseline data were used to characterize native mercury capture across the ESP while no sorbent was injected. During the baseline test period, Unit 6 was maintained at standard full-load conditions, about 435 MW, between the hours of 06:00 and 18:00 with the air pollution equipment operated under standard full-load conditions.

Throughout the baseline test periods, mercury measurements were made at the ESP inlet and outlet with the mercury CEMs. During three days of the baseline test period, several manual measurements were also conducted at the inlet and outlet of the ESP, including the following:

- ASTM M6784-02 Ontario Hydro Method (Speciated Mercury)
- STM, based in part on the method described in 40 CFR Part 75 Appendix K (previously EPA draft Method 324)
- EPA M5/M17 (Particulate Concentrations)
- EPA M26a (Halogen and Hydrogen Halide Concentrations)
- EPA M29 (Multi-Metals)
- Controlled Condensate (SO_3 Measurement)

Because of the influence of HCl and HF on sorbent effectiveness, measurements (M26a) of these gases were made at the same time as the Ontario Hydro tests. The outlet particulate emissions are a key parameter to assess the impact of carbon injection on ESP performance. Therefore, particulate emission measurements were made with EPA Methods 5 (ESP outlet) and 17 (ESP inlet).

SO_3 has been shown to affect the capacity of activated carbon for mercury control at some sites. Although the specific interaction is not well understood, the presence of naturally occurring SO_3 from the coal can decrease mercury capture, sometimes dramatically. In order to evaluate the potential effects of SO_3 at Conesville, measurements were conducted at the inlet of the ESP during the baseline period using the controlled condensate method (see Appendix G: Source Testing Report).

Parametric Testing

Following the baseline test period, five weeks of parametric testing were conducted: March 21–24, March 27–31, May 8–12, May 15–19, and August 23–25, 2006. A short test using the coal additive KNX was conducted on July 13, 2006. Tests were conducted at injection concentrations up to 18 lb/MMacf with 21 different sorbent blends. Test sorbents included nine E-series sorbents (12, 13, 14, 15, 18, 19, 20, 25, 25c) and a finer version of DARCO® Hg called Insul. The DARCO® E-series products included mixes of alkali with carbon, other substrates (e.g., wood-based carbon), and other mixes of sorbents and materials designed to protect the sorbents from SO_3. Several of these materials were produced by NORIT at the request of the test team.

Mercury measurements were made with the CEMs and STMs during the parametric tests to characterize mercury capture with sorbent injection. During baseline and parametric testing, measurements of spark rates and duct opacity were taken to evaluate ESP performance.

Sorbent Injection Screening

The parametric testing phase included several rounds of short sorbent evaluation tests to find a sorbent that could meet the removal goals of the program. These tests consisted of sorbent injection at the maximum achievable continuous feed rate of the injection system for 2 to 3 hours. Due to difficulties controlling the feed rate, the actual injection concentrations, although relatively constant for each material, ranged from 9 to 18 lb/MMacf during the first two weeks of testing. The problems with the feeder were resolved during the second week of testing and all subsequent tests were conducted at an injection concentration of 8 lb/MMacf.

Stratification Testing

Previous modeling of multi-nozzle lance arrangements indicates that most of the sorbent exits the bottom nozzle of the injection lance, resulting in higher mercury removal at the bottom of the duct. At the beginning of the second round of parametric testing, duplicate STM tests were conducted at depths of 5 and 10 feet across the width of the ESP outlet to determine if mercury stratification was present. Additional modeling and stratification measurements were conducted to assure the test team that the poor mercury removal measured was a function of the sorbent properties and not the distribution grid.

KNX Testing

During the final round of parametric testing, a halogen-based coal additive, KNX, developed by ALSTOM Power, was evaluated for its effect on mercury baseline removal and when injecting untreated activated carbon. KNX was applied to the coal prior to entering the boiler by adding it to coal feeders A, B, D, and E. Vapor-phase mercury measurements were made with the CEMs at the ESP inlet and outlet, as well as at the WFGD outlet.

RESULTS FROM CONESVILLE TESTING

The field-testing at Conesville was divided into two parts: baseline and parametric. During baseline testing, no sorbent was injected into the duct; however, as is typical for most plants, coal characteristics did vary over this period. During parametric testing, the performance of many sorbents was evaluated. Results from each test series are included in this section.

Modeling studies were also completed before and during field-testing to gain better insight into sorbent distribution and mercury removal at Conesville. Results from these efforts are summarized below.

CFD Modeling

REI modeled sorbent injection and mercury removal at Conesville by using computational fluid dynamics (CFD), incorporating two-phase chemically reacting flow, and iterating the gas composition (Hg species) with sorbent particle trajectories. This approach allowed REI to recommend the appropriate injection grid layout, and provided insight into the potential mercury removal at Conesville (see Appendix H: CFD Model Report).

The injection grid was originally designed with twelve lances, one for each of the 12 injection ports at the ESP inlet, as shown in Figure 3. The CFD model showed that the outer two lances, positioned outside the outermost turning vanes, caused poor distribution of sorbent density on the outer edge of the ESP. A second iteration of the model showed better sorbent distribution with the outermost two lances removed from service. The sorbent density for these two cases is presented in Figure 7 and Figure 8. Based upon the CFD model results, the test team opted to use the 10-lance design for sorbent evaluations at Conesville.

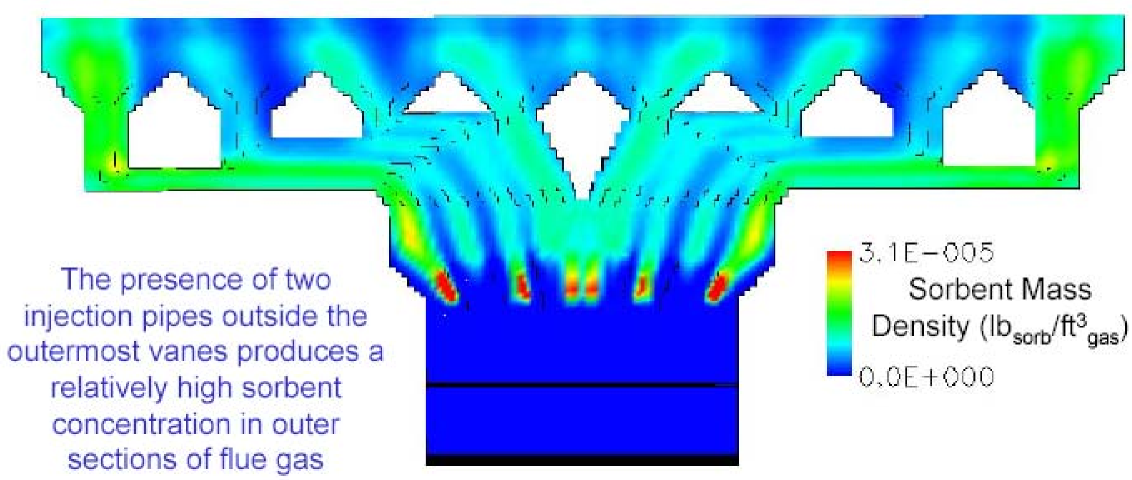


Figure 7. Sorbent Mass Density with Twelve (12) Lances in Service. (Courtesy of REI.)

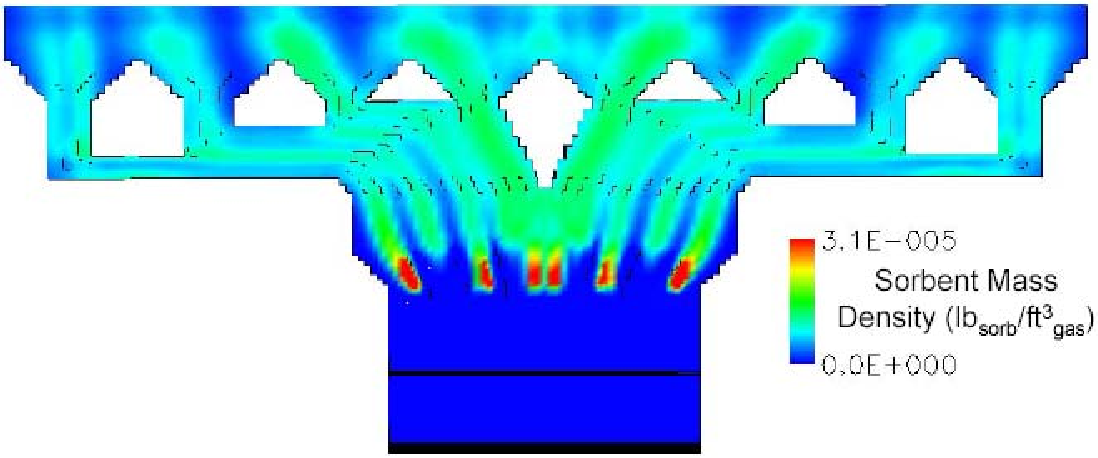


Figure 8. Sorbent Mass Density with Ten (10) Lances in Service. (Courtesy of REI.)

The factors incorporated into REI's model to predict mercury removal at Conesville included equilibrium adsorption capacity data for $HgCl_2$ provided by URS group, the assumption that the adsorption capacity for elemental mercury was twice that for $HgCl_2$, and the use of the Freundlich isotherm to model the sorption of mercury species.

Tests conducted at P4 for ADA-ES by URS Group under DOE contract DE-FC26-00NT41005 indicate that the equilibrium adsorption capacity is affected by both temperature and SO_3. Figure 9 shows that the capacity of DARCO® Hg was reduced by more than 50% if injected downstream of the SO_3 conditioning system. In the downstream location, the capacity was reduced further at higher temperatures. A temperature increase from 250 ºF to 300 ºF in the presence of SO_3 decreased the capacity by a factor of 10. These were important considerations for Conesville because the concentration of SO_3 was expected to be high, based on historic SO_3 measurements, and there is a significant temperature gradient in across the duct.

The first REI model runs predicted mercury removal efficiency for DARCO® Hg of 45% at an injection concentration of 9.95 lb/MMacf. This included the effects of a temperature gradient across the duct at Conesville of about 50 ºF. The model indicates that the temperature will affect mercury removal from side-to-side, but there is little difference in the average removal for the unit whether it is modeled as isothermal (44% Hg removal at 350 ºF) or with the temperature gradient (45% Hg removal at 325 to 375 ºF). The average Hg removal predicted with 12 lances was also similar to that with 10 lances (44% for 12 lances with the temperature gradient, 45% for 10 lances with the temperature gradient). However, the Hg removal predicted at the middle ports was 10% higher with 10 lances because of the better sorbent distribution across the ESP. These predictions were heavily dependant on the sorbent capacity curves, which are specific to each site and not available for Conesville at the outset of the project.

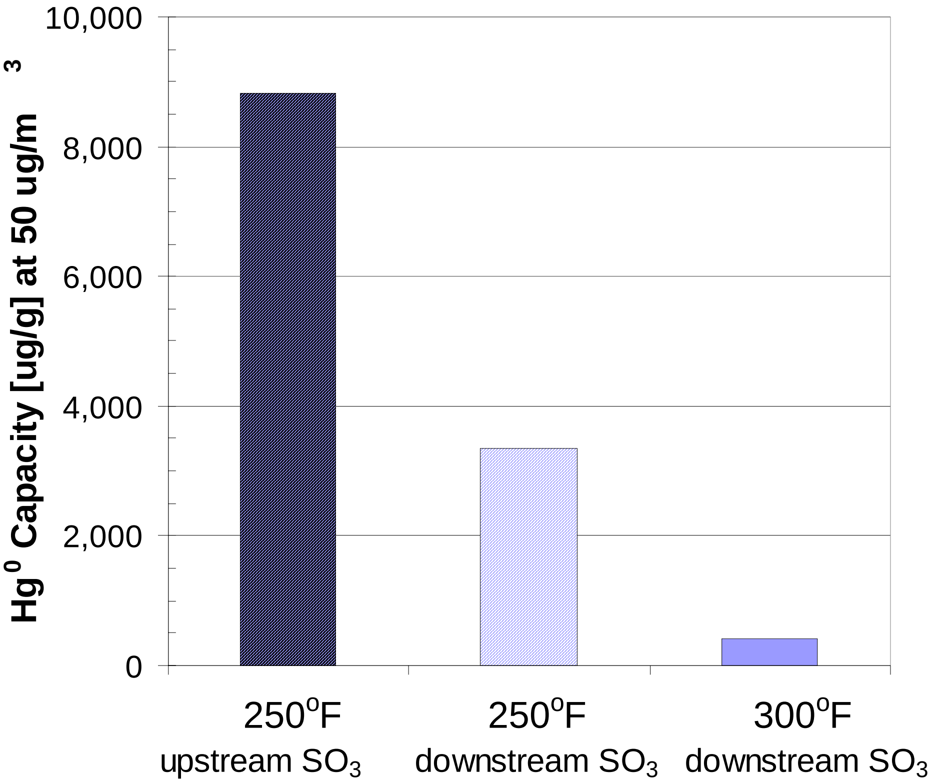


Figure 9. Equilibrium Adsorption Capacity of Hg^0 measured at P4.

REI ran another scenario to include the influence of high SO_3 concentrations on sorbent capacity. When the sorbent capacity was reduced by 50%, the predicted mercury removal decreased by 23% (from 45% to 34%) at 9.95 lb/MMacf DARCO® Hg. Results from the model suggest that, because the capacity of DARCO® Hg is significantly reduced in the presence of SO_3, both the quantity and capacity of the sorbent influence the overall removal.

REI was able to further improve model predictions by incorporating the results of the fixed-bed sorbent screening tests when they became available. Figure 10 shows the equilibrium capacities used in the model for Hg0 and $HgCl_2$. The temperature-dependence of capacity was derived from previously published information from URS on fixed-bed capacity. The capacity data were adjusted to fit the measured equilibrium capacity in the Conesville flue gas.

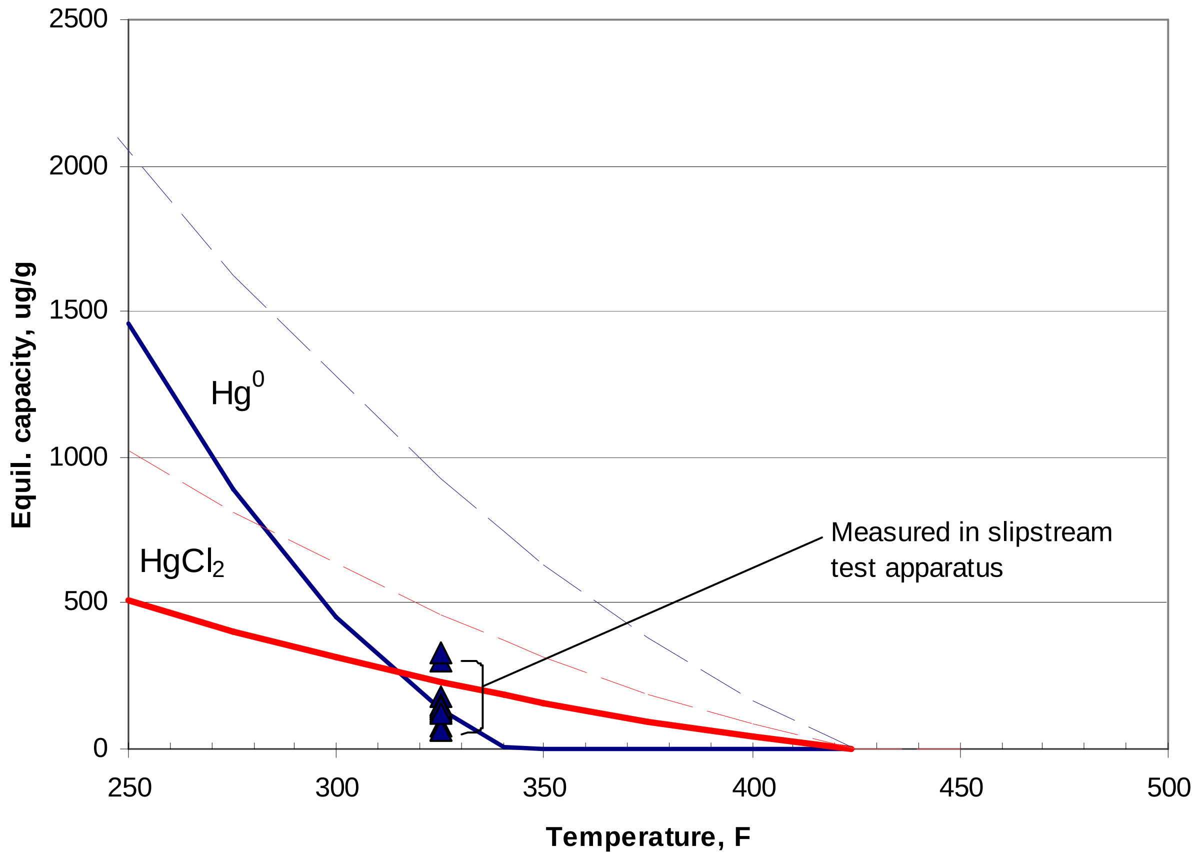


Figure 10. Model Equilibrium Adsorption Capacity Curves for DARCO® Hg. (Courtesy of REI.)

The updated simulation results showed that DARCO® Hg, injected at 10 lb/MMacf, would give 9–22% mercury removal depending on the reactivity used. Furthermore, the model predicted nominally 6–13% less removal in the hot side of the duct, depending on the reactivity used.

At other test sites, including P4, the capacity of the sorbent was high enough that no changes in mercury removal were measured during full-scale injection tests even with SO_3 conditioning in-service. At P4, and similar sites with sufficiently high sorbent capacity, the mercury removal approached diffusion-limited for some particle sizes, meaning the performance was limited by how quickly mercury reached a carbon particle. In the case of Conesville, the capacity of the sorbents estimated by REI (based on fixed-bed results) is low enough that the mercury removal performance is impacted by the low capacity level. In other words, more mercury is reaching the carbon particle than the particle can adsorb. However, if the mercury removal at Conesville was solely capacity-limited, it would decrease by half when the capacity was reduced by half, instead of the 23% reduction indicated by the model; thus, diffusion limitations at this site remain an area of interest.

Baseline Test Results

Baseline testing (no sorbent injection) was conducted during the week of March 13, 2006. The coal fired during baseline came from the CAM-Ohio and Oxford mines, as well as from the Conesville coal processing plant (mine not defined). The coal blend was typical for Conesville and produced a weighted average of 3.5% sulfur and 12,920 Btu/lb (dry basis). Mercury concentration in these coals varied from 144–268 ng/g. A summary of select coal parameters is presented in Table 9.

Table 9. Conesville Unit 6 Baseline Coal Analyses (Dry Basis).

	Mine			Weighted Average
	CAM-Ohio	Oxford	Conesville PP	
Ash (%)	8.7	13.6	10.1	11.9
Sulfur (%)	2.4	4.1	2.5	3.5
Hg (ng/g)*	268	256	144	
Br (µg/g)*	11.8	23	6.1	
Cl (µg/g)*	1140	687	808	
HHV (Btu/lb)	13,710	12,586	13,082	12,920
% Total Fired**	22	61	17	

** Hg, Br, Cl values from single coal samples, others are average of received loads, dry analysis*
*** Percent of total coal fired during baseline testing*

CEMs and Ontario Hydro Measurement Test Results

Figure 11 shows the Ontario Hydro, STM, and CEM mercury trends at the inlet and outlet of the ESP during the baseline test. The upper plot shows the results for total mercury, and the lower, elemental mercury. The ESP inlet and outlet CEM values trended well together given the considerable variability in the mercury concentrations over the course of the week (14 to 40 $\mu g/m^3$). The CEM and Ontario Hydro measurements indicate little mercury removal across the ESP. Analyses of ash collected during the baseline test also show low mercury removed across the ESP as presented in the "Fly Ash Analysis" section, which follows.

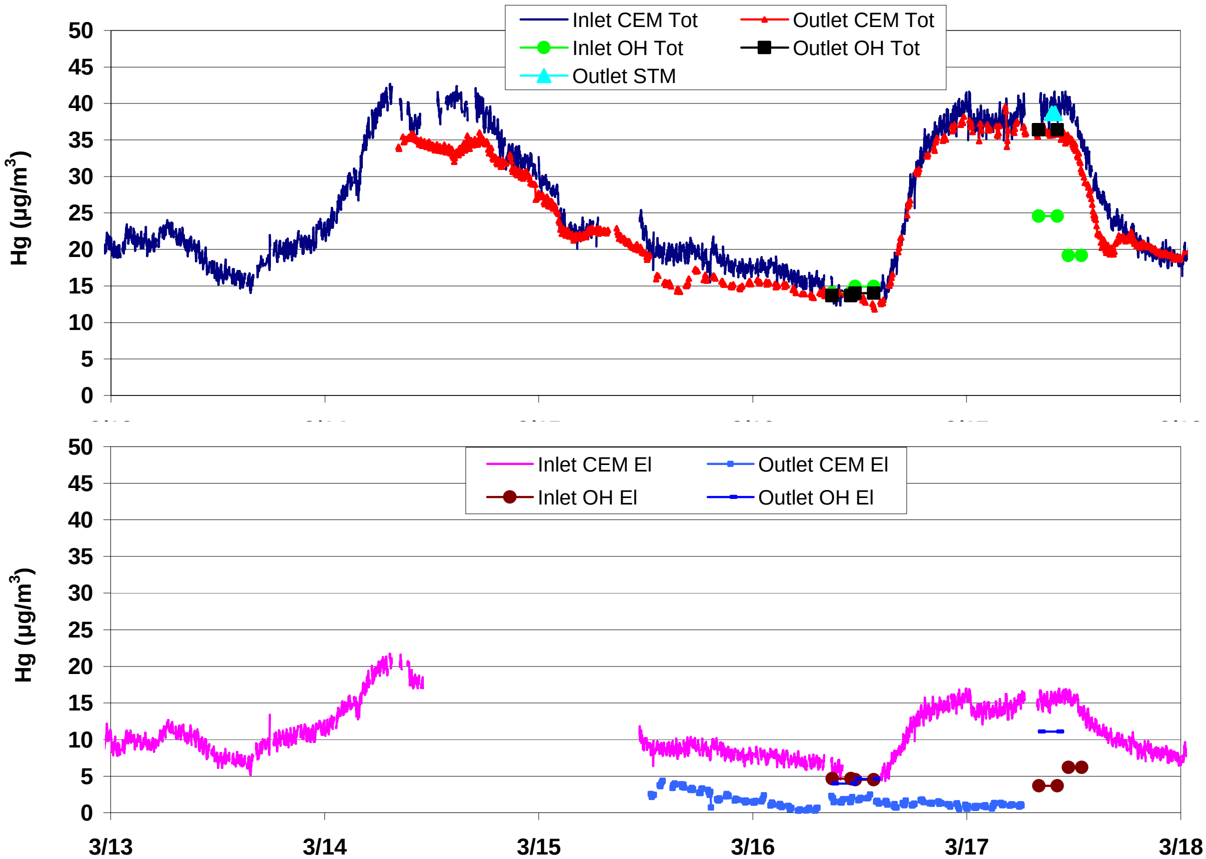


Figure 11. Baseline Mercury Data from CEMs, Ontario Hydro, and STM.

Results from the baseline Ontario Hydro runs across the ESP and at the WFGD outlet are shown in Tables 10, 11, and 12. The data are presented by runtime (rows) and sample location (columns) to allow comparison of data collected at the same time. ESP inlet and outlet measurements were conducted simultaneously. Only one WFGD run overlaps ESP inlet data. Table 10 provides a comparison of the Ontario Hydro and CEMs data.

During the first day of Ontario Hydro testing, the inlet and outlet measurements matched the CEM measurements within 20%. During the second day, the outlet CEM and Ontario Hydro matched within 2%. The outlet STM was within 7% of the CEM. The inlet comparison was not as tight during the second day. The inlet Ontario Hydro measurements were significantly lower than both the CEM and the outlet Ontario Hydro. The sampling test firm re-analyzed the aliquots to determine whether a laboratory artifact caused the lower-than-expected inlet vapor-phase mercury measurements. The results of the re-analysis indicate that the initial laboratory results met all quality control criteria. The samples were also sent to URS for laboratory quality assurance checks and the mercury measurements were confirmed to be low. The lower-than-expected mercury measurements indicate a problem with the operation of the sampling equipment by the sampling crew (see Table 10, Inlet #4 run). Furthermore, all of the manual sample tests performed during the same day by the test crew—inlet measurements, particulate, SO_3 controlled condensate, etc.—were outside of the expected range.

The Ontario Hydro data indicate very little mercury removal across the ESP, and little particulate-bound mercury at the ESP inlet, except for the two runs at the ESP inlet on March 17, 2006. At both the inlet and outlet of the ESP, vapor-phase mercury speciation is predominantly oxidized (about 70%). The CEMs data at the ESP inlet during the Ontario Hydro runs indicate an oxidized fraction of about 60%. At the WFGD outlet, the mercury was predominantly elemental (about 90%).

The Ontario Hydro data indicated 37% removal across the WFGD, while the CEMs data showed 60%. This suggests that most of the oxidized mercury is removed in the wet scrubber. The CEM elemental mercury at the ESP outlet was low compared to the Ontario Hydro measurements.

Table 10. Ontario Hydro Results at ESP Inlet and Outlet.

Test		ESP Inlet				ESP Outlet			
Date	Start and End Times	OH Part. Hg (µg/dNm^3)	OH Elem. Hg (µg/dNm^3)	OH Ox. Hg (µg/dNm^3)	OH Total Hg (µg/dNm^3)	OH Part. Hg (µg/dNm^3)	OH Elem. Hg (µg/dNm^3)	OH Ox. Hg (µg/dNm^3)	OH Total Hg (µg/dNm^3)
3/16/06	08:55–11:00	0.11	5.32	10.67	16.0	0.003	4.52	11.05	15.57
3/16/06	11:30–13:35	0.07	5.12	11.83	16.96	0.03	5.26	10.69	15.95
3/17/06	08:05–10:10*	1.66	4.18	35.54	40.9	0.004	12.6	43.48	56.08

* Aliquots were reanalyzed by Platt and results showed higher values at the ESP outlet than inlet.

Table 11. Ontario Hydro Results at ESP Inlet and WFGD Outlet.

Test		ESP Inlet				WFGD Outlet			
Date	Start and End Times	OH Part. Hg (µg/dNm^3)	OH Elem. Hg (µg/dNm^3)	OH Ox. Hg (µg/dNm^3)	OH Total Hg (µg/dNm^3)	OH Part. Hg (µg/dNm^3)	OH Elem. Hg (µg/dNm^3)	OH Ox. Hg (µg/dNm^3)	OH Total Hg (µg/dNm^3)
3/17/06	11:25–12:58	4.61	7.06	21.94	33.61	0.005	13.61	2.7	16.31
3/17/06	13:20–15:02	--	--	--	--	0.005	13.57	0.95	14.53
3/17/06	15:25–16:59	--	--	--	--	0.005	7.2	0.78	7.99

Table 12. Comparison of Ontario Hydro Results and CEM Data.

ESP Location and Run	Date	Start and End Times	OH Elem. Hg (µg/wsm3)	OH Total Hg (µg/wsm3)	CEM Elem. Hg (µg/wsm3)	CEM Total Hg (µg/wsm3)	% Error Elem.	% Error Total	% Removal	
									OH	CEM
Inlet #2	3/16/06	8:55–11:00	4.7	14.1	6.0	13.8	-27.3	-1.7	2.7	-1.9
Outlet #2			4.0	13.7	--*	14.1	--*	-2.9		
Inlet #3	3/16/06	11:30–13:35	4.5	14.9	5.3	13.1	-17.8	12.1	6.0	0
Outlet #3			4.6	14.0	--*	13.1	--*	6.6		
Inlet #4	3/17/06	8:05–10:10	3.7	29.0	15.3	39.4	-317.1	-35.7	-48.2	8.2
Outlet #4			11.1	36.4	--*	36.1	--*	0.7		

* Elemental data not available for this time period.

Temperature Stratification

The temperature across the ESP is stratified because of the air pre-heater design. Thermocouples were placed in five sorbent injection ports to monitor temperatures during baseline testing. The average temperature measurements measured on March 16–17, 2006, are shown in Table 13 (see Figure 3 for port designations). The average gradient for these days was 75 ºF (290 ºF at Port 2, A-Side; and 365 ºF at Port 10, B-Side).

Table 13. Average Temperatures in Sorbent Injection Ports.

	Temperature (ºF)				
	Port 2	**Port 4**	**Port 7**	**Port 9**	**Port 11**
3/16/06	296	315	332	356	368
3/17/06	288	309	326	350	360

Fly Ash Analysis

Ash collected during baseline testing was analyzed for mercury and loss on ignition (LOI). Mercury values from March 15 samples, presented in Figure 12, show that the mercury in the inlet field, Field 1, decreases from west to the east (i.e., Hopper 25-cool side to Hopper 32-hot side). However, this trend does not continue in the later fields. The units used in Figure 12 can be converted to mercury concentrations corresponding to 0.06 to 0.15 lb/TBtu. For comparison, the Ontario Hydro measurements of March 16 and 17 at the ESP outlet produced mercury concentrations of 13.3 to 35.4 lb/TBtu. This confirms that little mercury was removed across the Conesville ESP. Figure 13 shows that the LOI concentrations for the same samples increased from Field 1 to Field 4. The inlet LOI ranged from 0.55 to 0.84%. The LOI measured in the outlet field ranged from 2.2 to 3.1%.

The fly ash mercury concentrations from the entire baseline test are presented in Figure 14. As shown, most of the mercury concentrations were below 100 ng/g Hg for all rows. However, some data from March 14 and 17 show higher mercury concentration, but even these represent a mercury capture of less than 1 lb/TBtu. The ash mercury concentration in the inlet field was nearly four times higher on the cool side of the ESP, indicating that the 75 ºF temperature variation across the duct affects the mercury removal of the native fly ash.

The variation of LOI values in the baseline samples ranged from 0.5 to 5.0 wt%. Ash LOI in the first field was under 1% in all cases, and more concentrated in the back fields. In the first two fields, the mercury content increases with increasing LOI, the middle and outlet field do not show the same correlation (see Figure 15). This may be due to a change in the characteristics of the LOI, such as the size, which could influence the mercury content.

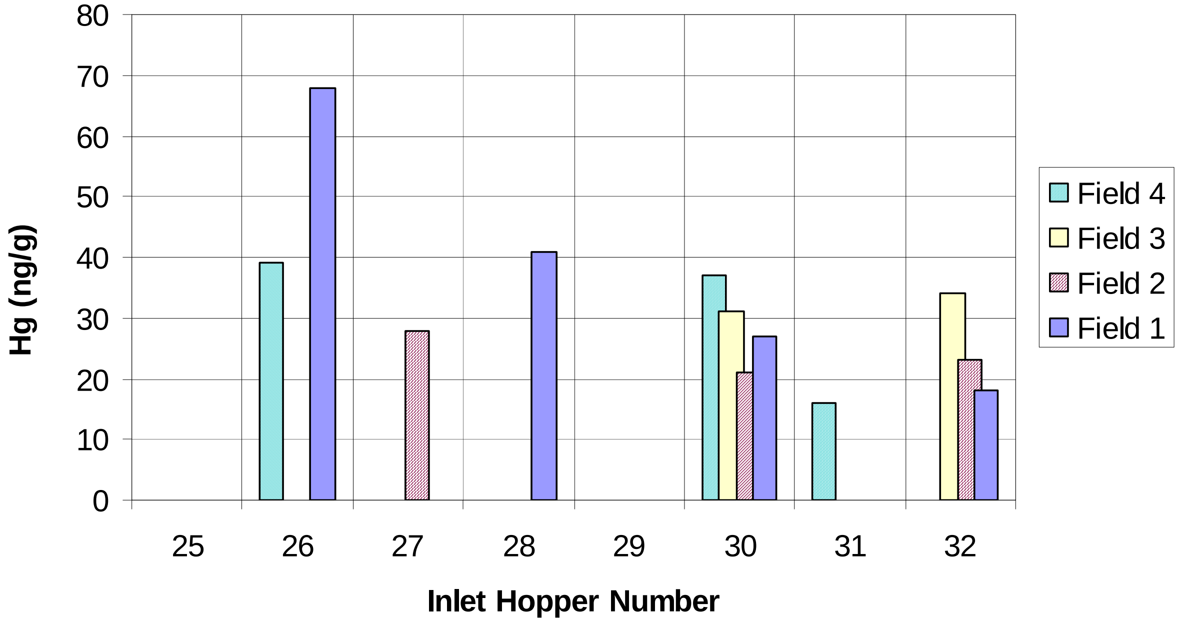


Figure 12. Mercury Concentration in Ash Samples from March 15, 2006.

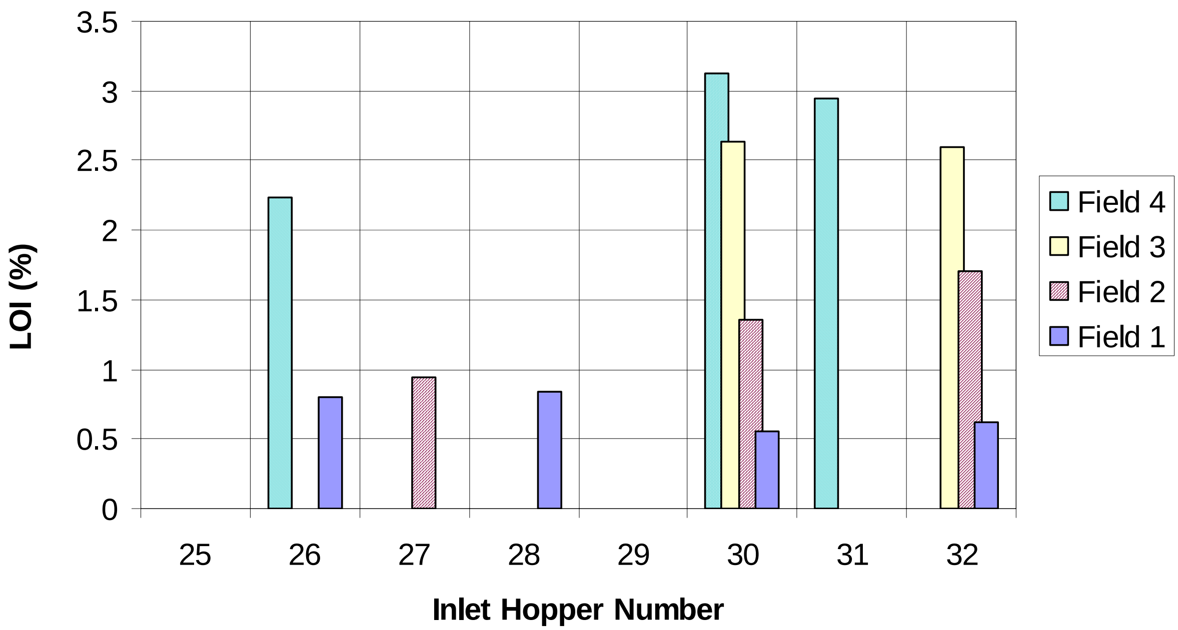


Figure 13. LOI of Hopper Ash Samples from March 15, 2006.

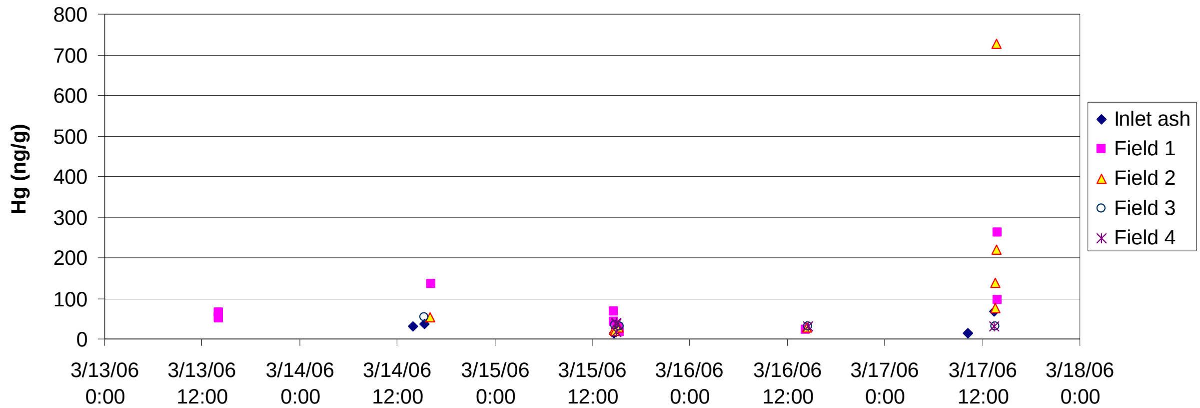


Figure 14. Mercury in Hopper Ash Samples from Baseline Tests.

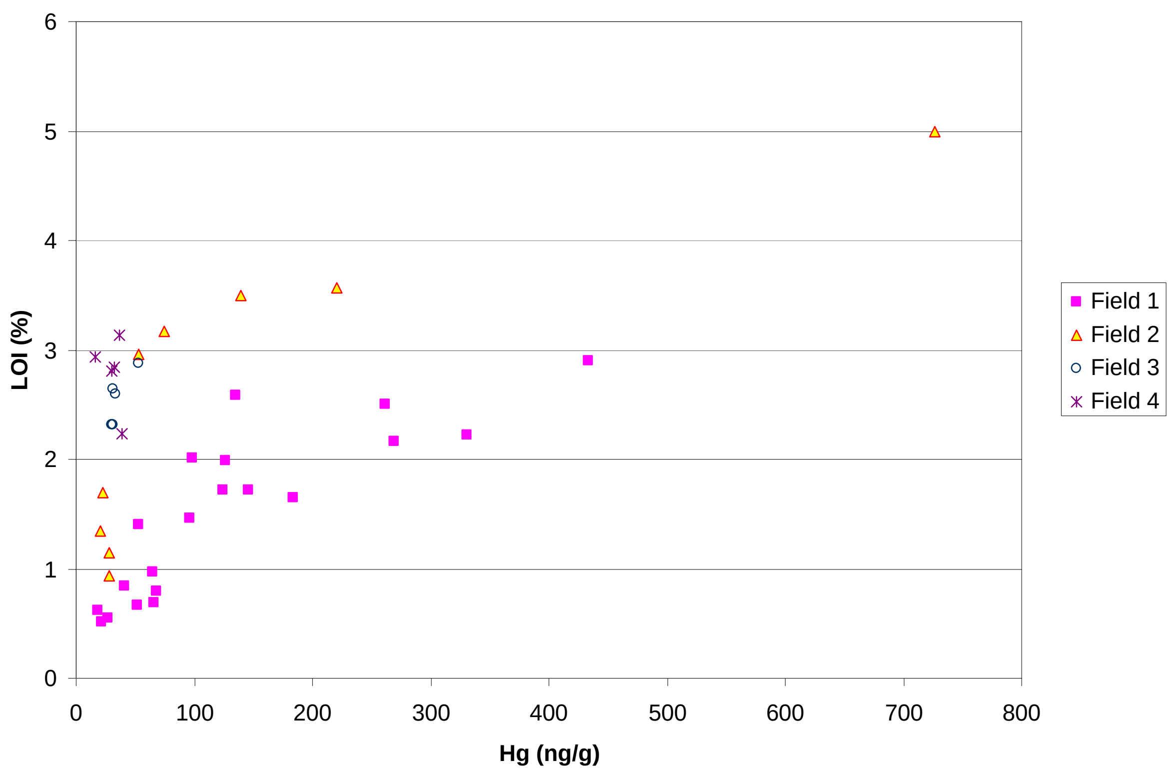


Figure 15. Mercury Variation with LOI.

EPA Method 5/17 Test Results

Results from EPA Method 17 tests at the ESP inlet indicate average particulate loading of 2.276 gr/dscf, and Method 5 results at the ESP outlet averaged 0.005 gr/dscf, for a particulate removal of 99.78% across the ESP. It should be noted that the outlet sampling locations are non-ideal in that the gas flow makes a turn just downstream of the sampling ports. This may bias the outlet measurements.

EPA M26a Test Results

The test results from EPA Method 26a (halogens) at the ESP inlet and outlet are shown in Table 14. Although, the values vary between the runs, especially for HCl and Cl_2, there is consistency between the ESP inlet and outlet results. It is rare to measure more Cl_2 than HCl in the duct, as occurred during the first sampling run at the inlet and outlet. The previously discussed issues with the on-site manual sampling crew's quality control are a potential reason for the unusual results.

Table 14. Results from EPA Method 26a Testing.

	ESP Inlet			ESP Outlet		
	Run 1 3/14/06 10:00–11:08	**Run 2 3/14/06 14:25–15:30**	**Run 3 3/14/06 16:20–17:25**	**Run 1 3/14/06 10:00–11:08**	**Run 2 3/14/06 14:25–15:30**	**Run 3 3/14/06 16:20–17:25**
HCl (ppm)	14.66	61.29	61.99	11.98	90.57	59.76
HF (ppm)	0.88	2.30	1.94	1.08	3.65	2.37
HBr (ppm)	0.27	0.53	0.55	0.22	0.47	0.27
Cl_2 (ppm)	30.95	0.03	0.16	28.86	1.32	0.57
Br_2 (ppm)	0.28	0.02	0.02	0.16	0.02	0.02

EPA M29 Test Results

EPA M29 (metals) measurements were also conducted during baseline testing. The project team had previously agreed to limit the analysis to mercury, selenium, and arsenic. These results are included in Table 15. There is significant variation in the arsenic and selenium concentrations during the three runs, and the calculated removal of these species varied widely. Results from elemental analysis on select coal and ash samples indicate that the arsenic and selenium can vary by a factor of three or greater. This is a potential explanation for some of the wide variations in measurements of the elements.

Table 15. Results from EPA Method 29 Testing.

		Run 1 3/15/05 08:00–09:30	Run 2 3/15/05 11:20–12:50	Run 3 3/15/05 16:15–17:45
Mercury (lb/TBtu)	Inlet	17.8	14.3	15.6
	Outlet	22.6	15.1	16.1
	% rem	***-26.9***	***-5.7***	***-3.0***
Arsenic (lb/TBtu)	Inlet	34.8	171.2	143.1
	Outlet	37.0	27.7	18.4
	% rem	***-6.3***	***83.8***	***87.1***
Selenium (lb/TBtu)	Inlet	115.2	105.6	558.0
	Outlet	145.5	77.8	90.5
	% rem	***-26.4***	***26.3***	***83.8***

Controlled Condensate (SO_3) Test Results

SO_3 measurements were also conducted at the inlet and outlet to the ESP during baseline testing. The preliminary test report indicates 2.6 ppm SO_3 at the inlet and 12 ppm SO_3 at the outlet. As previously discussed, the manual inlet measurements are questionable due to potential sampling procedural errors.

Parametric Testing Results

Parametric testing at Conesville confirmed previous results that high-sulfur flue gas is a challenging environment for mercury control via sorbent injection. All results from the parametric test phase, including the full-scale injection tests, the sorbent screening tests, and any additional analyses are described in the following sections.

Mercury Removal

Mercury removal efficiency across the ESP ranged from 5 to 31% at injection concentrations of 9 to 18 lb/MMacf for all sorbents tested at full-scale. Injection tests at 9.5 lb/MMacf with DARCO® Hg resulted in only 8% removal, slightly less than was predicted by the CFD model. The highest removal attained was 31% using DARCO® E-12 at 12 lb/MMacf. The next-highest removal was 25% using Sorbent Technologies EXP-2 at 10 lb/MMacf. Although the injection concentrations varied widely, the results indicate that none of the sorbents were able to achieve the minimum mercury removal goal of 50% at an injection concentration below 10 lb/MMacf. Figure 16 presents the mercury removal efficiency across the ESP for several sorbents tested at full-scale. An example of the CEM mercury trend graphs representing the second week of parametric testing is shown in Figure 17. During several later tests, the open-ended dual-injection lance configuration was used on the B-Side of the duct. No significant difference in performance was noted between the half-duct, open-ended nozzle tests and tests across the entire duct with the multi-nozzle lance configuration. Figure 18 is a compilation of all parametric full-scale test results.

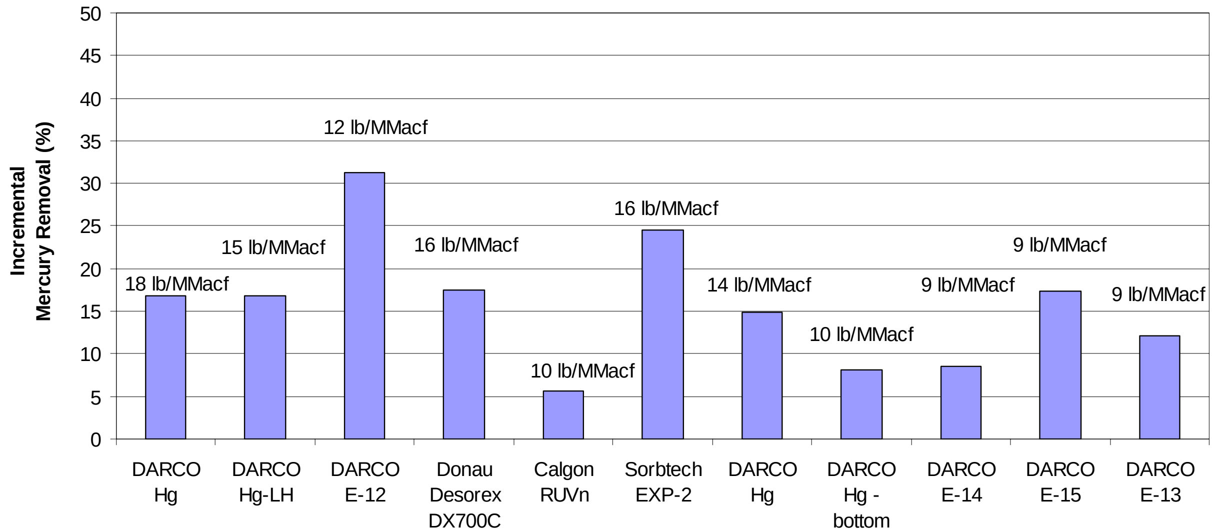


Figure 16. Comparison of Sorbent Effectiveness at Conesville.
(Mercury was sampled about 4 feet from the top of the duct except for "DARCO® Hg-bottom," which was sampled 4 feet from the bottom of the duct.)

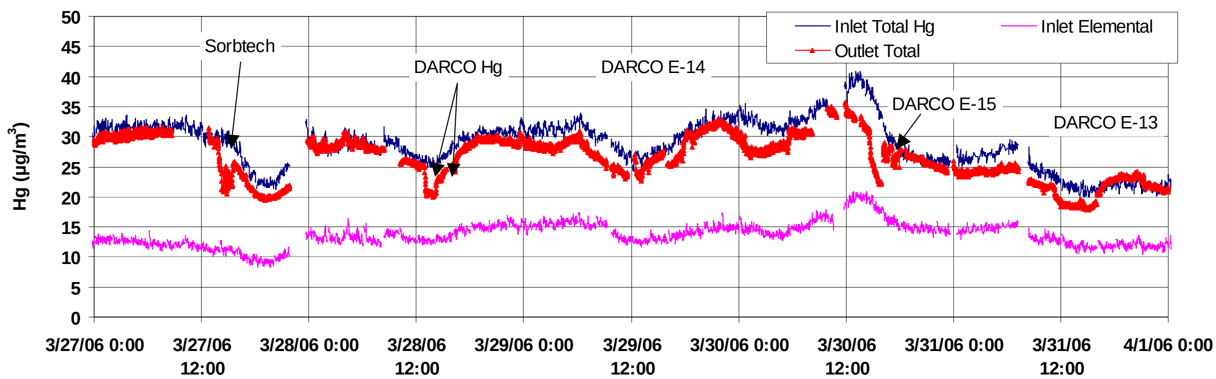


Figure 17. CEM Mercury Trend Graph during Parametric Test Week 2.

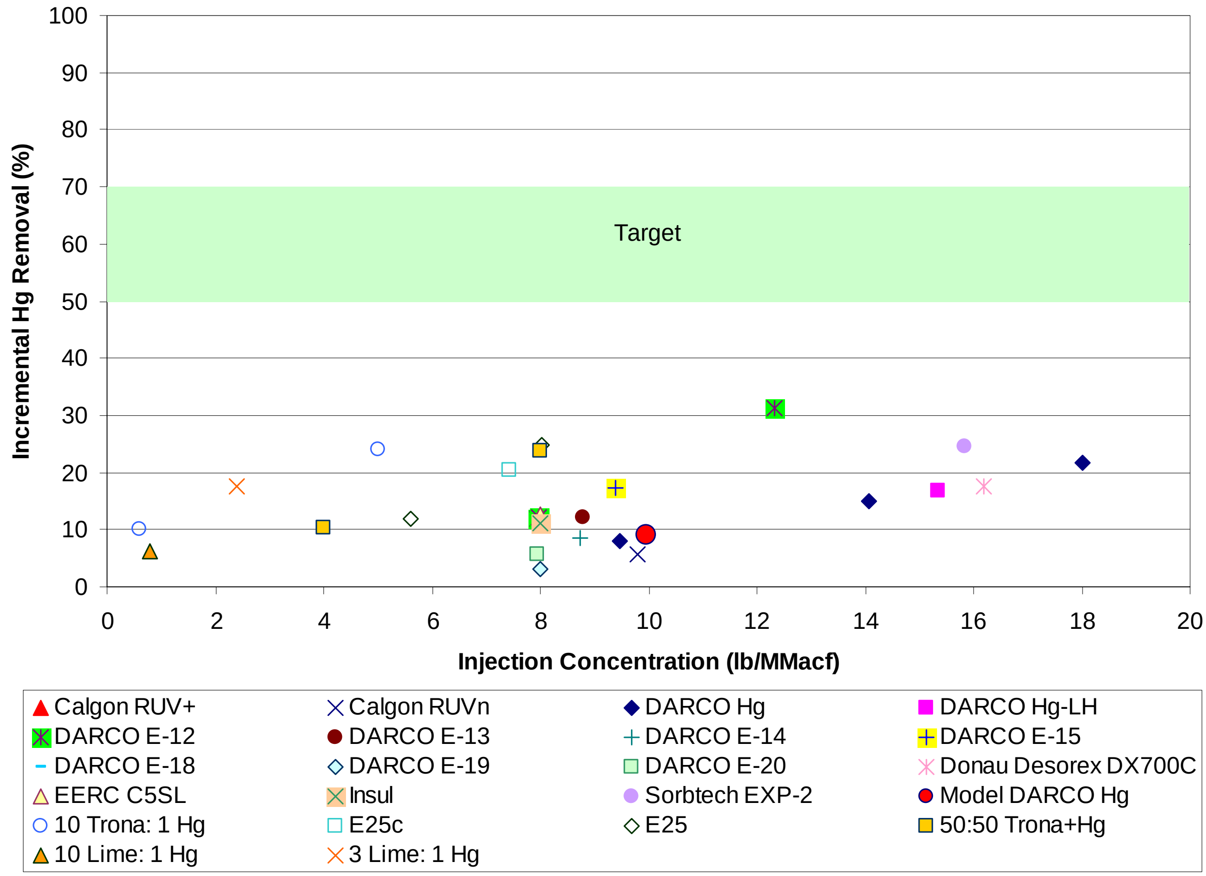


Figure 18. Parametric Results for Full-Scale Testing at Conesville Unit 6.

Temperature Variation

The temperature of the flue gas was consistently 75 ºF higher on the east side of the ESP compared to the west side because of the air pre-heater arrangement. The temperature variation was consistent from day to day. The average temperatures at the injection plane are presented in Table 16 for several tests.

Table 16. Average Temperatures in the Sorbent Injection Ports.

	Temperature (ºF)				
	Port 2	Port 4	Port 7	Port 9	Port 11
DARCO® Hg	286	308	323	349	359
DARCO® Hg-LH	286	309	323	351	360
DARCO E-12	287	307	322	347	357
Donau Desorex DX700C	285	305	320	346	358
Calgon RUVn	287	309	324	350	359
Sorbtech EXP-2	287	306	319	345	358
DARCO® Hg	288	308	322	348	360
DARCO® Hg – bottom	286	307	321	347	358
DARCO® E-14	287	306	320	345	357
DARCO® E-15	291	307	319	346	361
DARCO® E-13	290	306	318	346	361

Stratification Evaluation

Results from the stratification measurements and CFD modeling indicate that neither the distribution grid nor duct layout can completely account for the poor mercury removal measured at Conesville. It is possible that the temperature gradient may have had some effect. The stratification measurement results are presented in more detail in the sections that follow.

Ash Analysis during Sorbent Injection

Hopper ash samples were collected and analyzed for mercury and LOI throughout parametric testing. To obtain the most representative sample possible for these short-term tests, all hoppers were emptied immediately before sorbent injection was initiated.

Results from the ash analyses were reviewed for any indications of sorbent stratification. An example from samples collected during DARCO® E-12 tests is presented in Figure 19 and Figure 20. As shown, both the mercury and LOI are higher on the west side (Hoppers 26 and 28). However, the LOI is not significantly higher than baseline when compared to expected values. Specifically, at an injection concentration of 12 lb/MMacf, the expected increase in LOI is 6.4%. This assumes a 186 lb/MMacf carbon loading to the ESP from incomplete combustion. The largest increase in LOI was measured in Hopper 28 at 1.2%, which is well below expected value. This suggests that the ash samples are not representative of the injection concentration. Because of this, it is difficult to conclude that there is sorbent stratification across the duct even though the figures may indicate it is present.

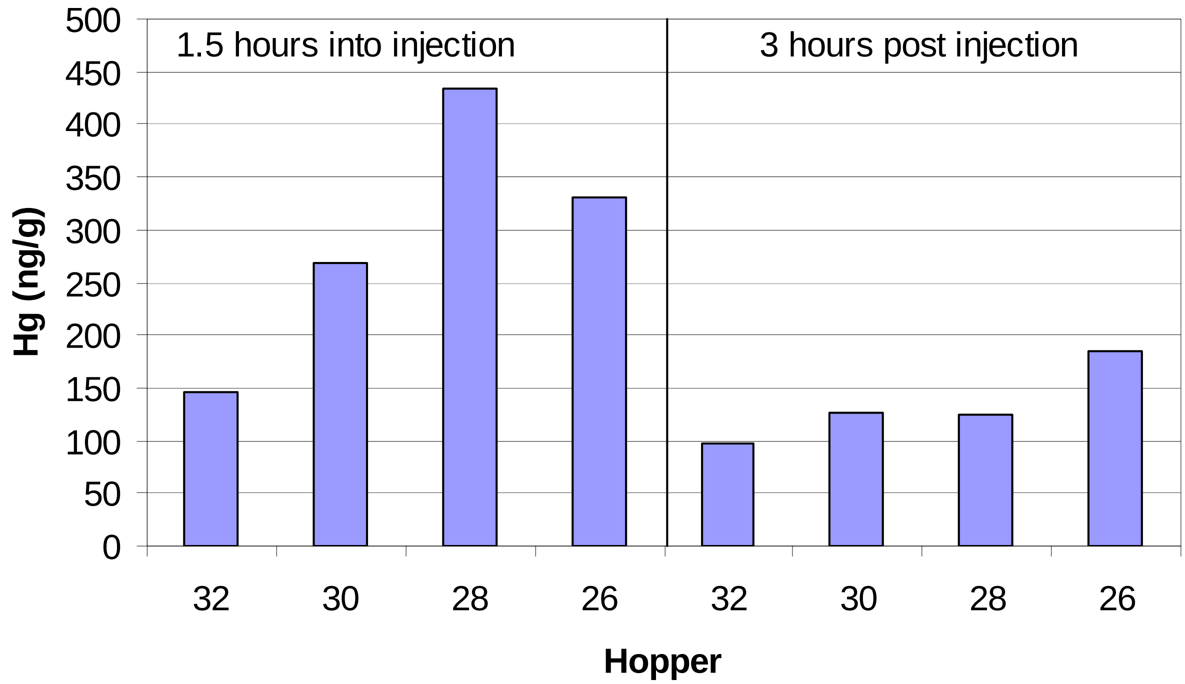


Figure 19. Mercury in Hopper Ash from DARCO® E-12 Tests.

Figure 20. LOI Carbon in Hopper Ash from DARCO® E-12 Tests.

Sorbent Distribution Measurements at the ESP Outlet

The test team conducted several sorbent stratification tests to determine if the poor performance was related to sorbent distribution in the duct. Figure 21 shows the results for one test in which DARCO® Hg was injected and CEM mercury measurements were made at two depths in Port 6. The measurements were made during two distinct injection periods and, due to difficulties with the sorbent feeder, the two injection concentrations were not identical. However, the data indicate that stratification from the top to the bottom is insignificant because the measured mercury removal was directly related to injection concentrations.

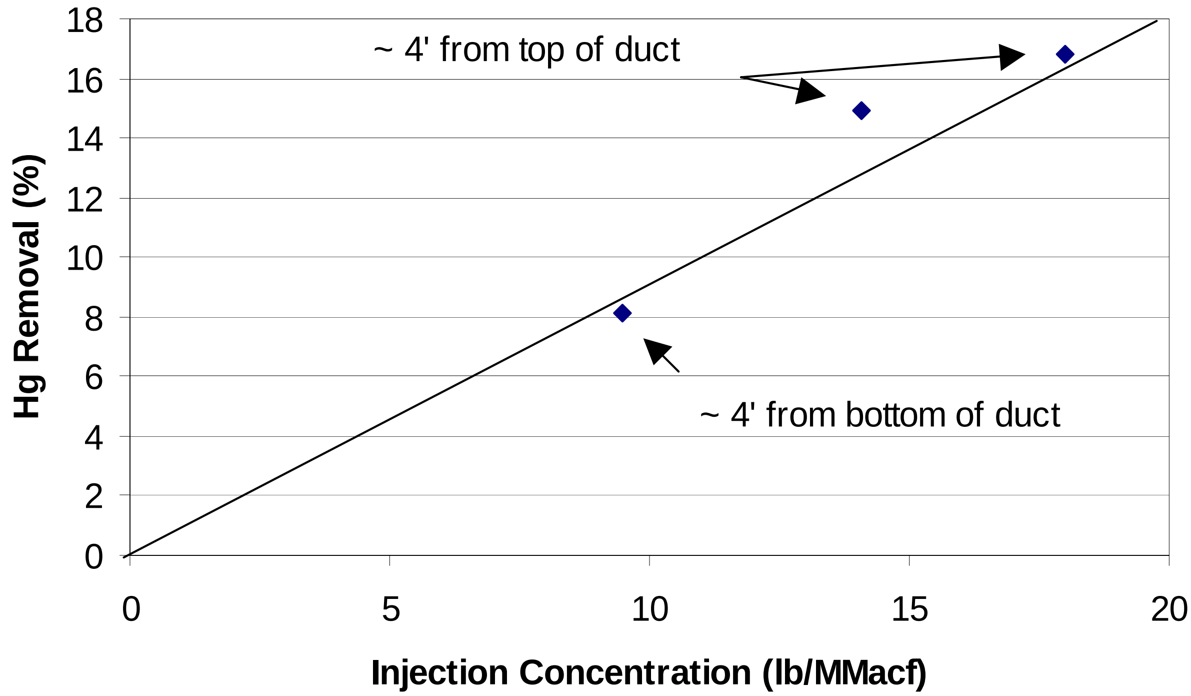


Figure 21. CEM Mercury Removal as a Function of Measurement Depth.

STM and CEM Comparison of Mercury Concentrations

STM tests were conducted during parametric testing to verify the total mercury measured by the Hg CEMs, and to determine if there was stratification across the duct. The STM results are shown in Figure 22 as they compare to the Hg CEMs. Refer to Figure 3 for port locations. The results show that the STM and Hg CEM data are similar regardless of sampling port or sampling depth. During a series of tests from March 17, 28, and 31, measurements were made with the STM and CEM in adjacent outlet Ports 5 and 6. On March 17 and 31, measurements were made in both ports at a depth of 4.5 feet. Mercury concentration using both techniques compared well. On March 28, an STM sample was collected at a duct depth of 11 feet. The difference from the CEM measurement was less than 7%. If the sorbent loading was appreciably different from the top of the injection lances to the bottom, the difference in the outlet measurements would be greater.

On March 31, STMs were done on the east and west ducts in Ports 5 and 2. The CEM, installed in Port 6, compared well with STM measurements in both Ports 2 and 5, suggesting there was insignificant variation in sorbent loading from the east to west. However, because lower removal is expected at higher temperatures, and the east side of the duct operates at higher temperatures than the west side, it can be argued that since the mercury concentrations from side to side show little difference, there may be higher sorbent loading on the east side to compensate for the higher temperatures. Since the carbon injection system is symmetrical from east to west, no stratification was expected.

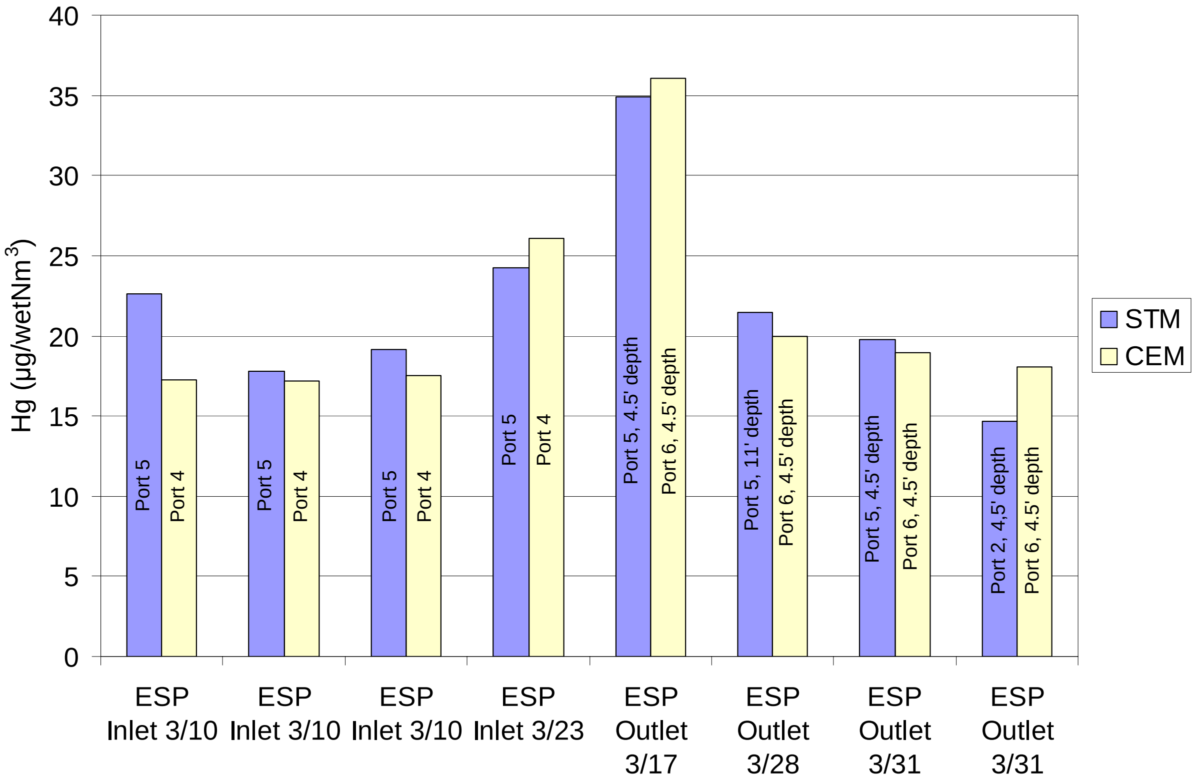
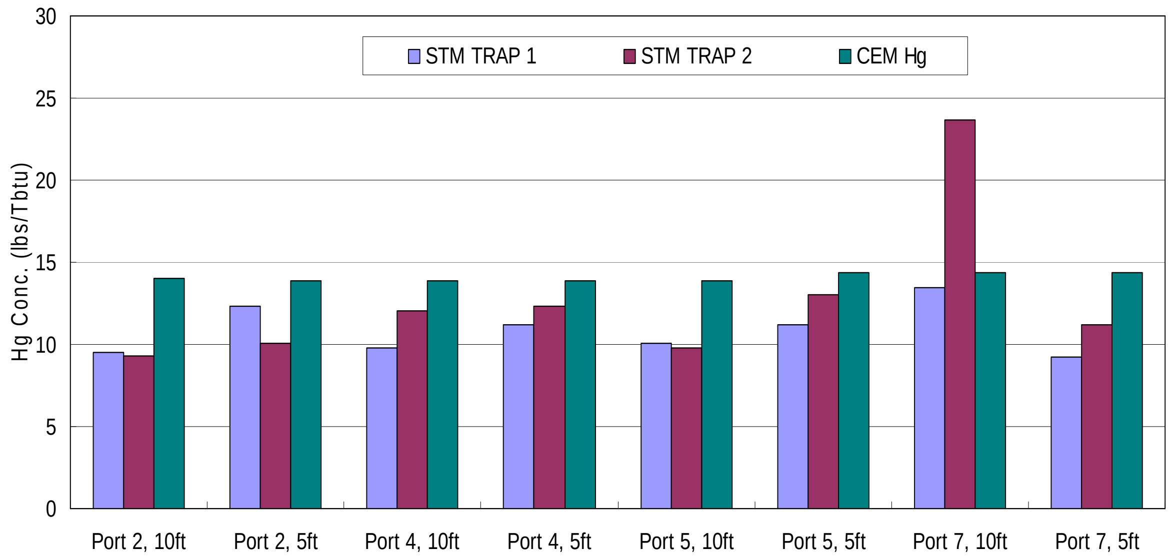


Figure 22. Mercury Stratification STM and CEM Results.

Mercury Removal at the ESP Outlet

On May 9, DARCO® E12 was injected at 8 lbs/MMacf for a period of 5 hours using the multi-nozzle lances. During this period, duplicate STM tests were conducted at depths of 5 and 10 feet across the ESP outlet to determine if there was any mercury stratification. Figure 23 shows the mercury concentrations as measured by the STMs and the CEM. For reference, the ESP outlet mercury CEM was sampling in Port 6 at a depth of 4.5 feet.

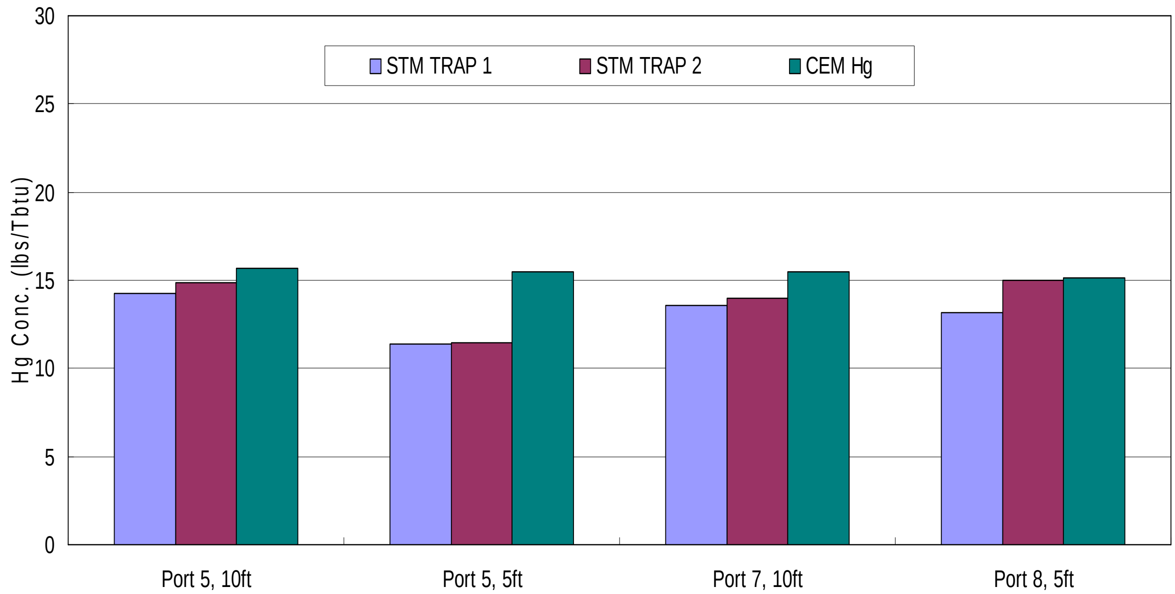


Port	1	2	3	4	5	6-CEM	7	8	Average
5 feet		11.2		11.7	12.1		10.2		11.3
10 feet		9.4		10.9	9.9		13.4		10.9
Average		10.3		11.3	11.0		11.8		

Figure 23. ESP Outlet Mercury with DARCO® E12 and Multi-Nozzle Lances.

CFD modeling of the multi-nozzle lances at other plants indicated that most of the sorbent exits the bottom nozzle of the injection lance, resulting in higher mercury removal at the bottom of the duct.[8,9] As shown in Figure 23, there is not a significant amount of top-to-bottom variation in the mercury concentrations measured at the ESP outlet. The average mercury concentration at 5 feet was 11.3 lb/TBtu and the mercury concentration at 10 feet was 10.9 lb/TBtu. The mercury concentration on the east side of the duct is slightly higher than the west, indicating that there may be some side-to-side sorbent stratification. Trap 2 from the 10-foot-deep Port 7 STM set was not included in these averages because it is likely an outlier.

For comparison, on May 10, DARCO® E12 was injected at 8 lbs/MMacf for a period of 5 hours using an array of single-nozzle lances. This test was conducted only on the east half of the unit with 2 lances installed in each port at depths of 5 and 10 feet. Figure 6 shows the single-nozzle injection array. Duplicate STM measurements were made on the east half of the ESP outlet. As shown in Figure 24, there was no significant top-to-bottom, and some minor side-to-side, mercury stratification across the ESP outlet, suggesting that the single-nozzle lance array does a reasonably good job of distributing the carbon equally in the flue gas.



Port	1	2	3	4	5	6-CEM	7	8	Average
5 feet					11.4			14.1	12.8
10 feet					14.6		13.8		14.2
Average					13.0		13.8	14.1	

Figure 24. ESP Outlet Mercury with DARCO® E12 and Single-Nozzle Lances (no injection on A-Side).

The results from STM measurements at the ESP outlet suggest the multi-nozzle and single-nozzle injection arrays distribute the sorbent reasonably well; however, because the mercury removal achieved during the testing is relatively low (16%), only small differences in the measurements are expected.

ESP Inlet Hopper Ash Analysis

Samples collected from the ESP inlet hoppers during the stratification testing provide additional information on sorbent distribution and mercury stratification. Figure 25 shows the mercury concentration of the ash collected by the ESP inlet field during injection of DARCO® E12 using multi-nozzle lances. The mercury concentration in the ash is higher on the west side of the unit than the east. Figure 26 shows that generally there is more LOI on the west side of the ESP than the east. Similar results were obtained during the stratification testing using the single-nozzle lances as shown in Figure 27 and Figure 28.

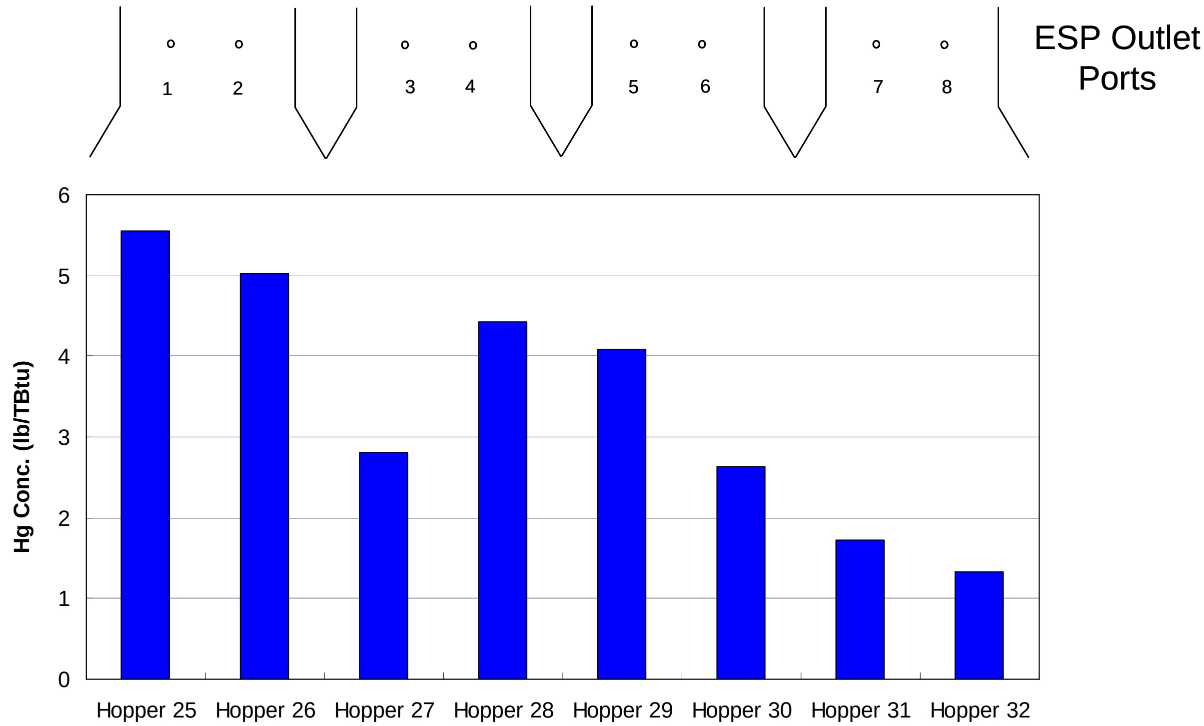


Figure 25. ESP Inlet Hopper Ash Mercury Stratification with Multi-Nozzle Lances.

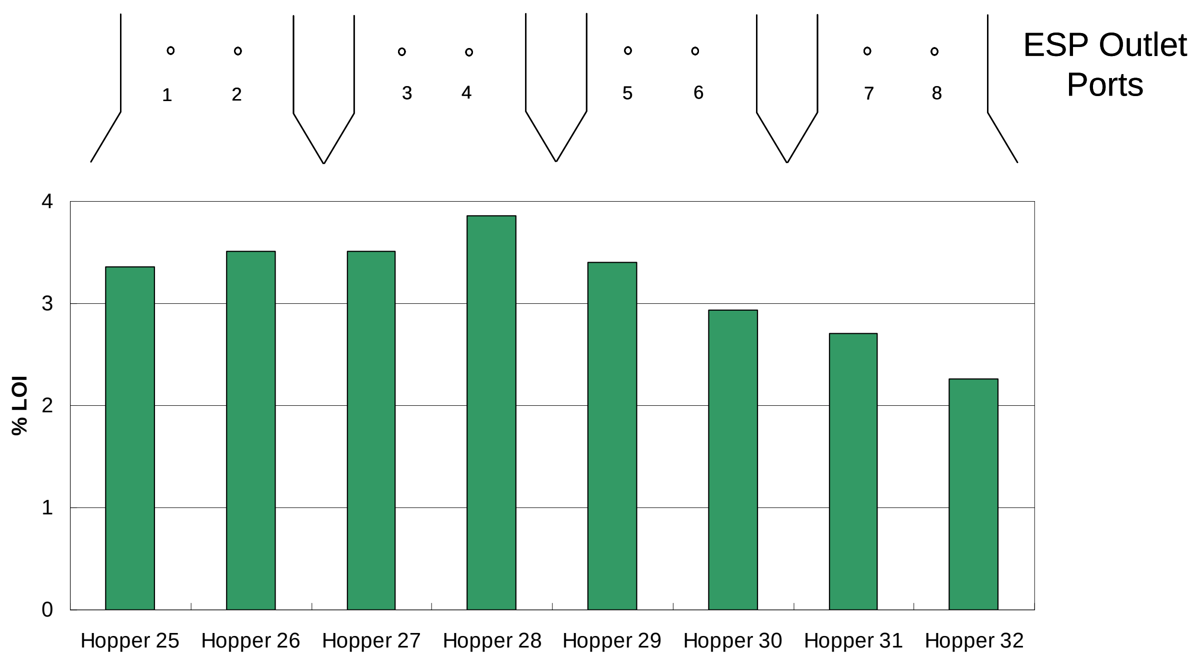


Figure 26. ESP Inlet Hopper Ash LOI Stratification with Multi-Nozzle Lances.

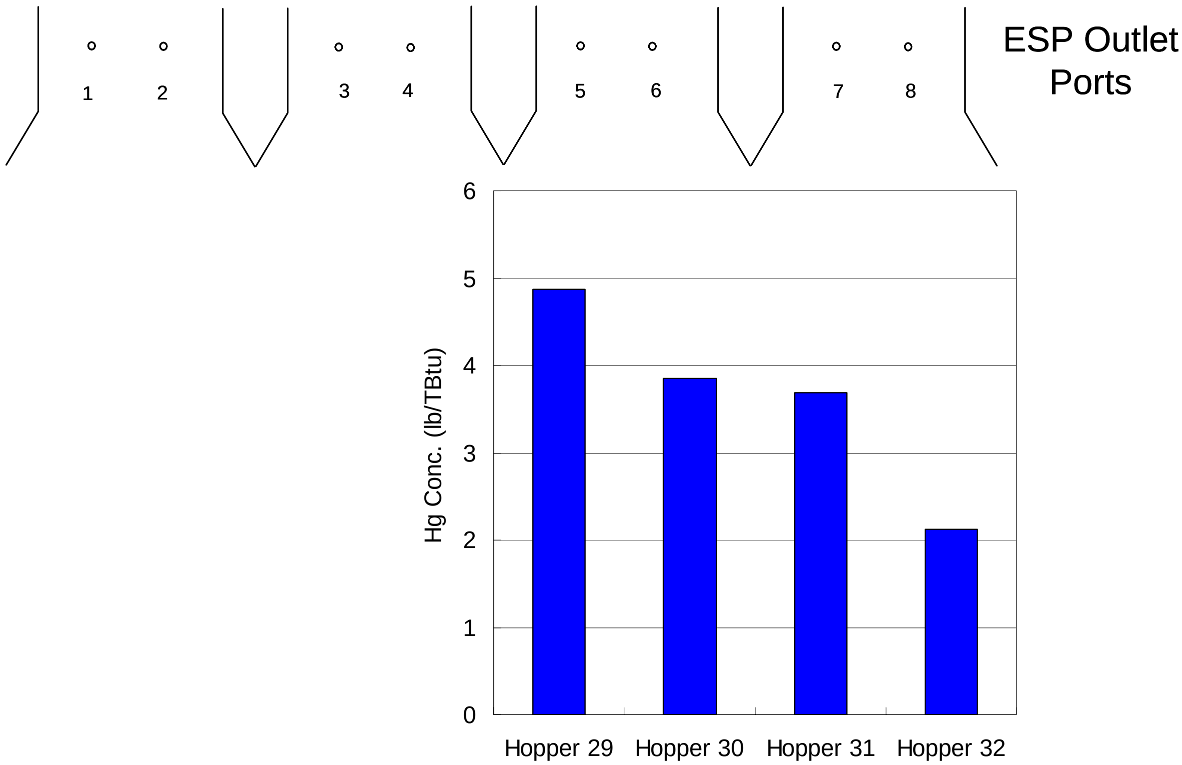


Figure 27. ESP Inlet Hopper Ash Mercury Stratification with Single-Nozzle Lances.

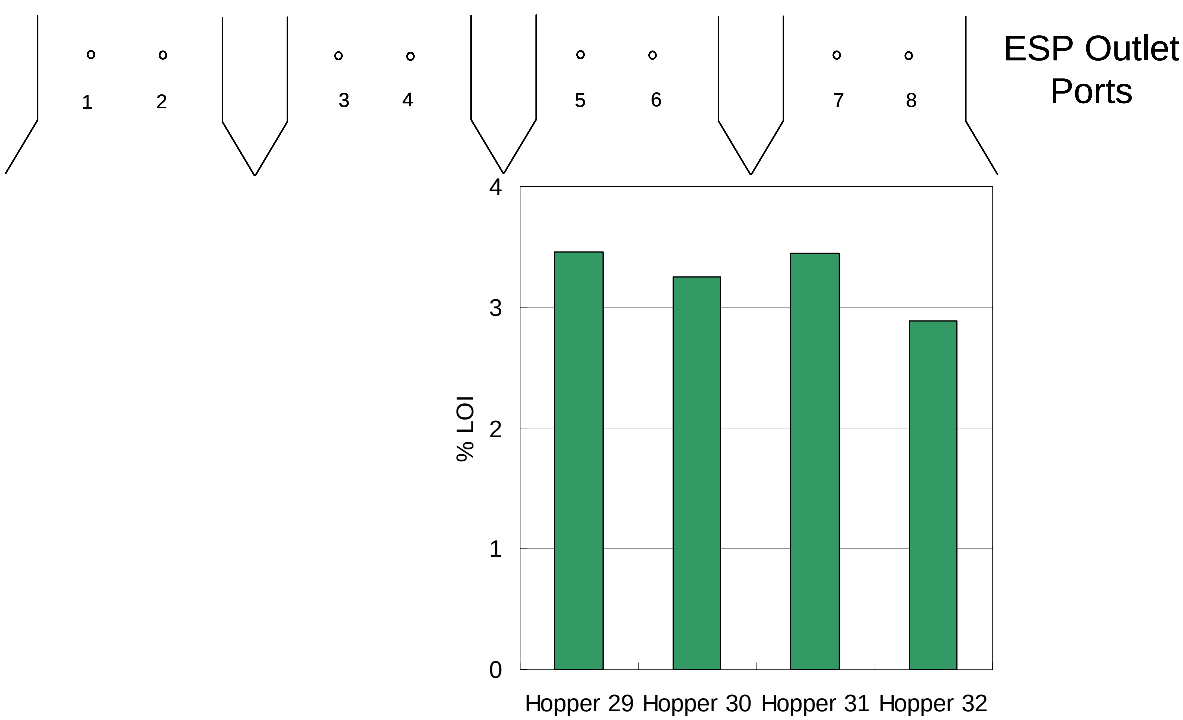


Figure 28. ESP Inlet Hopper Ash LOI Stratification with Single-Nozzle Lances.

Six additional sorbents were injected using the single-nozzle lances following the DARCO® E12 injection tests, and similar trends in ESP inlet hopper ash mercury concentration and LOI were seen as shown in Figure 29 and Figure 30. In Figure 31, the mercury concentration in the ash is directly proportional to the amount of LOI in the ash. These data indicate more clearly that the sorbent is not distributed uniformly from side to side as indicated by the LOI and mercury content in the hopper ash.

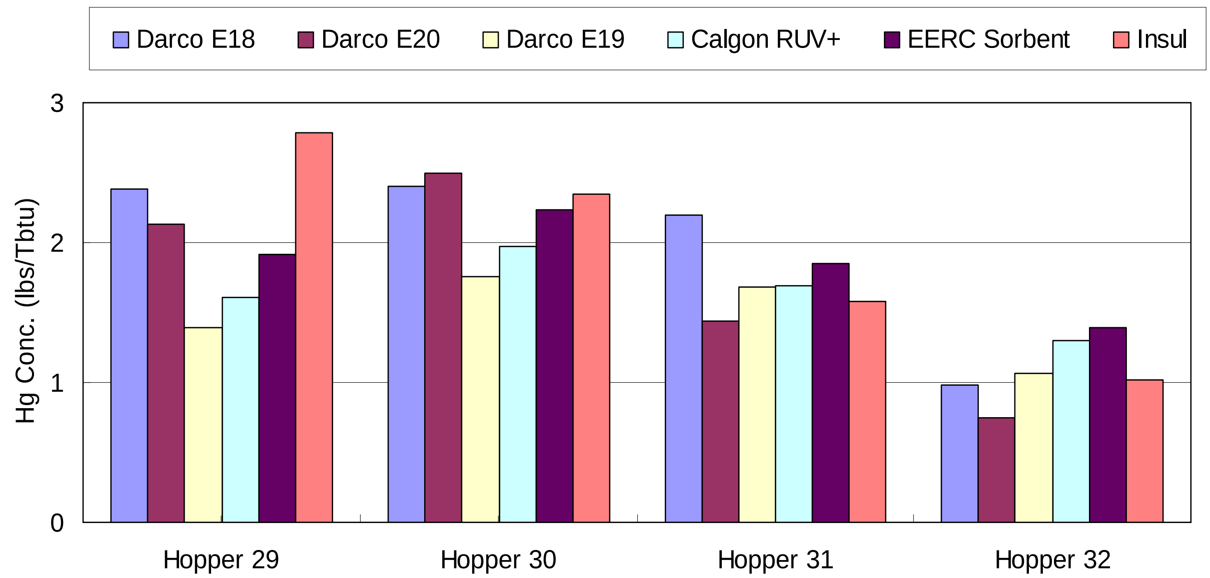


Figure 29. ESP Inlet Hopper Ash Mercury from Six Sorbent Tests with Single-Nozzle Lances.

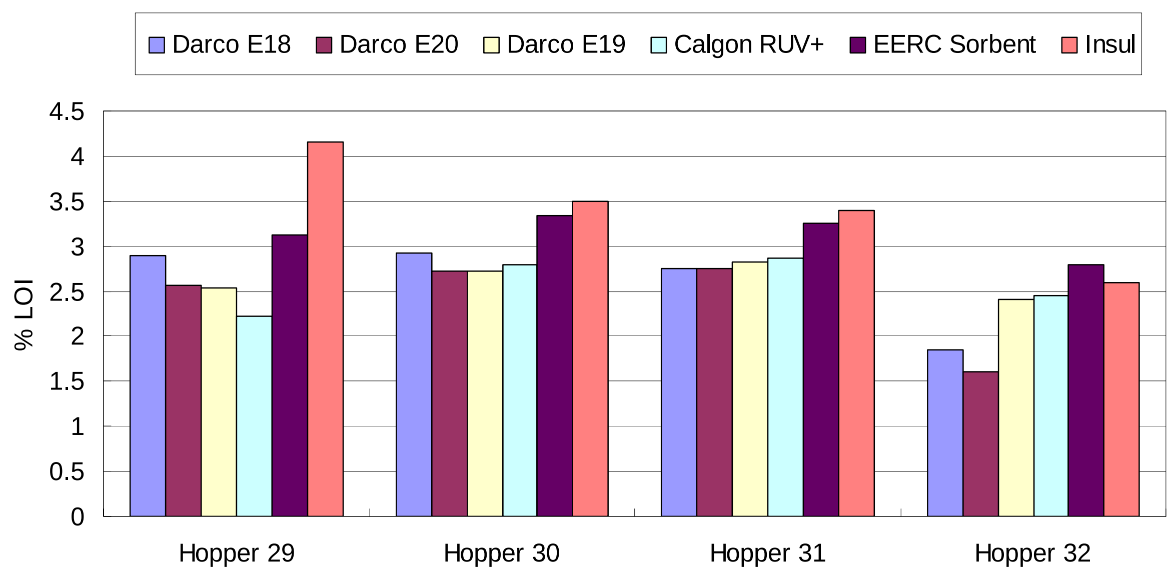


Figure 30. ESP Inlet Hopper Ash LOI from Six Sorbent Tests using Single-Nozzle Lances.

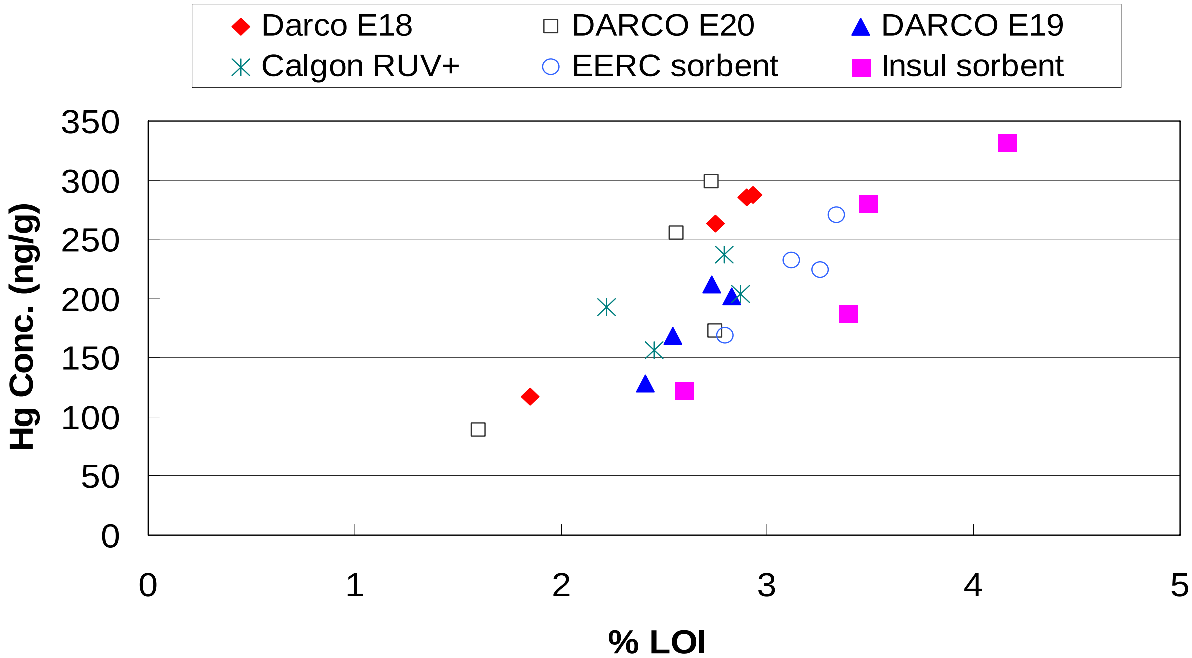


Figure 31. Relationship between LOI and Mercury in ESP Inlet Hopper Ash.

Although both the STM and ash analysis results indicate that more sorbent is entering the west side of the ESP, this amount of stratification is not expected to be the cause of the poor mercury removal results. For reference, the highest mercury removal achieved based on the ash samples was only 2.7 lb/TBtu compared to an ESP outlet concentration of about 11 lb/TBtu.

ESP Performance

ESP performance was affected by some sorbents in terms of spark rates and power. Opacity spikes were noted during some tests. Results of ESP performance monitoring are presented in the sections below.

Spark Rates and Power

Most of the sorbents tested resulted in increased sparking in the ESP. Moreover, spark rate generally increased as sorbent concentration increased as shown in Figure 32. The increase in sparks per minute in the TR sets corresponding to the first two mechanical fields is shown in Figure 33. There are two TR sets per mechanical field (as defined by the hopper locations) and the spark rate in these two electrical fields was averaged to simplify the presentation of the results. Thus, spark rate in TR sets A and C was averaged for Field 1 on the east side (B-Side), and B and D were averaged for Field 1 on the west side (A-Side). As shown in Figure 33, the impact of sorbent injection on spark rate was much more pronounced on the B-Side than on the A-Side. During these tests, sorbent was being injected upstream of both sides of the ESP.

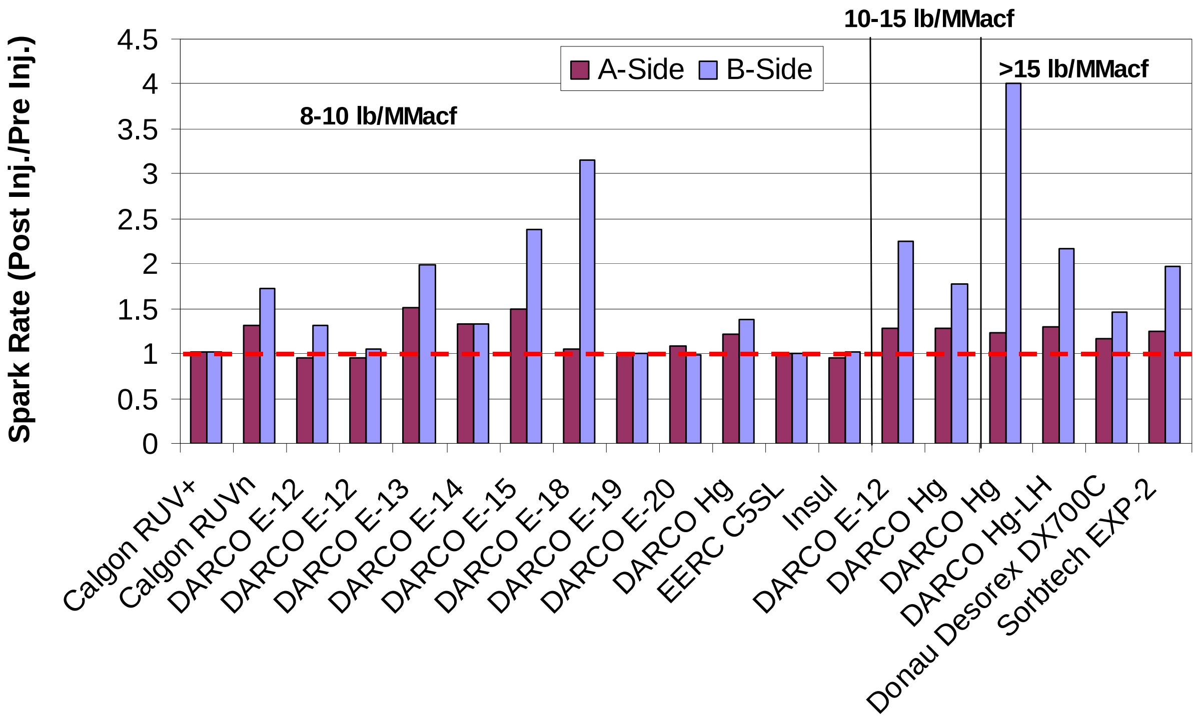


Figure 32. Impact of Sorbent Injection on Spark Rate.

One theory that may explain the impact of sorbent in ESP performance is the interaction of the sorbent with SO_3. SO_3 concentration affects the resistivity of the fly ash and the resulting behavior of the ESP as ash is collected. The effect of SO_3 on resistivity trends towards zero as the temperature approaches 350 ºF, with an insignificant effect at temperatures greater than 350 ºF. The data shown in Table 5-8 indicate that the temperature of the B-Side during high load operation ranges from 319 to 361 ºF and that the A-Side ranges from 285 to 309 ºF. Any changes in the SO_3 concentration due to sorbent injection should have a greater impact on the B-Side of the duct because more SO_3 is required to improve the resistivity at higher temperatures than at lower temperatures. Thus, the impacts on ESP performance noted do not necessarily indicate higher sorbent loading on the east side compared to the west.

The data presented in Figure 33 and Figure 34 appear to suggest that the impact of sorbent injection on ESP spark rate is worse in the outlet fields. However, the ESP was often spark-rate limited in some of the inlet fields prior to beginning injection. Therefore, no increase in spark rate was recorded for these inlet fields. Reference Figure 3 for a sketch of the ESP layout and TR set identification.

In addition to mercury measurements, ADA-ES pulled one lance on each side to determine if deposits were forming, which could cause sorbent maldistribution. No visible differences in the lances were noted. The sorbent feed system has two feeder trains, one for each side of the duct. To determine if the feeder train influenced ESP operation, the trains were switched on March 23, 2006. No changes in ESP operation were noted.

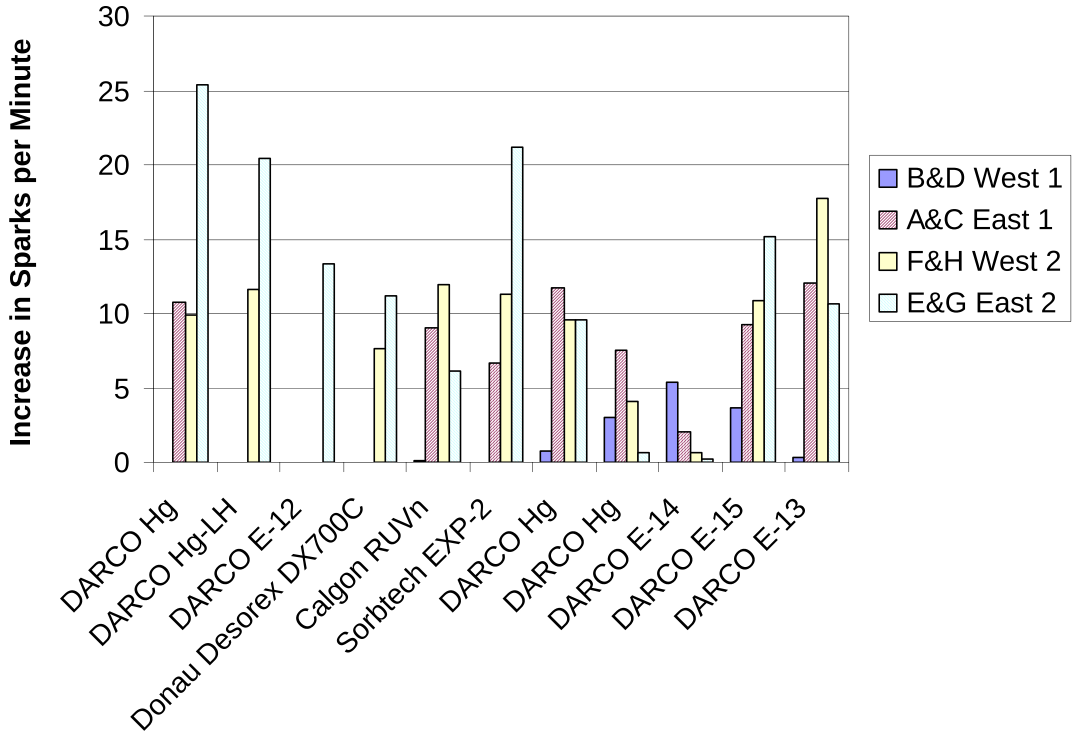


Figure 33. Increase in Spark Rate during Sorbent Injection—Inlet Fields.

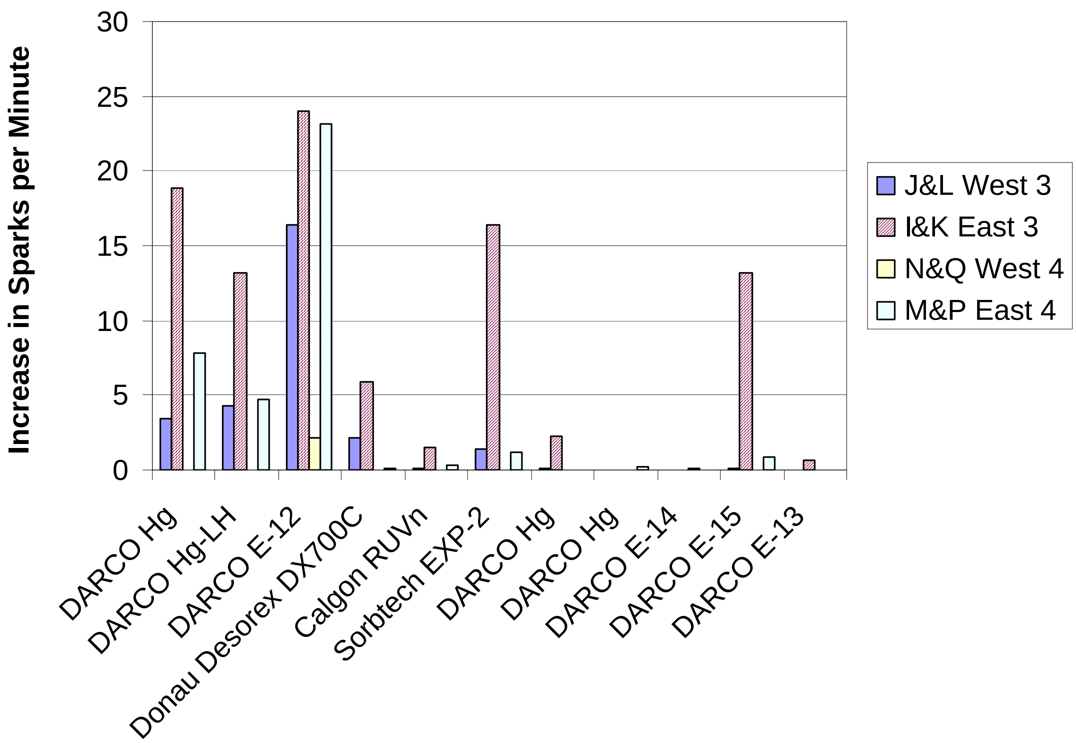


Figure 34. Increase in Spark Rate during Sorbent Injection—Outlet Fields.

For reference, the spark rate for TR Sets A through I on the east side are presented in Figure 35. As shown, it is obvious that the ESP is responding to sorbent injection by the increased sparking on several TR sets. The ESP power was also reduced on several TR sets during sorbent injection. This is shown for the inlet fields in Figure 36 and Figure 37, where the data are presented as a percent of baseline power. It appears that the largest impact was seen in TR sets C, D, E, and F, where the power during sorbent injection was often less than 70% of the power prior to injection (baseline). Although not shown graphically, there was little change in the ESP power on the outlet TR sets due to sorbent injection.

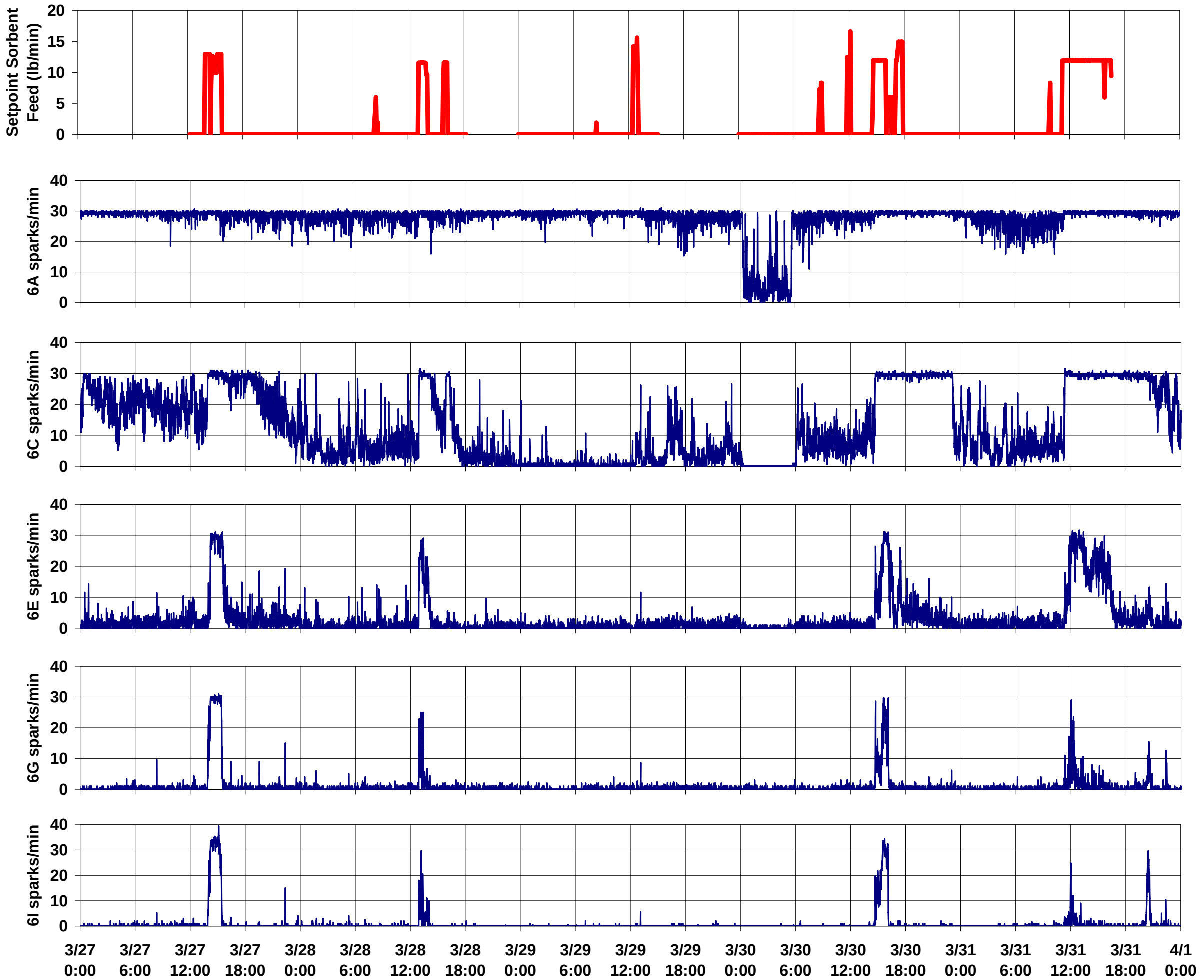


Figure 35. B-Side ESP Spark Rate in Fields A-I during Parametric Week 2.

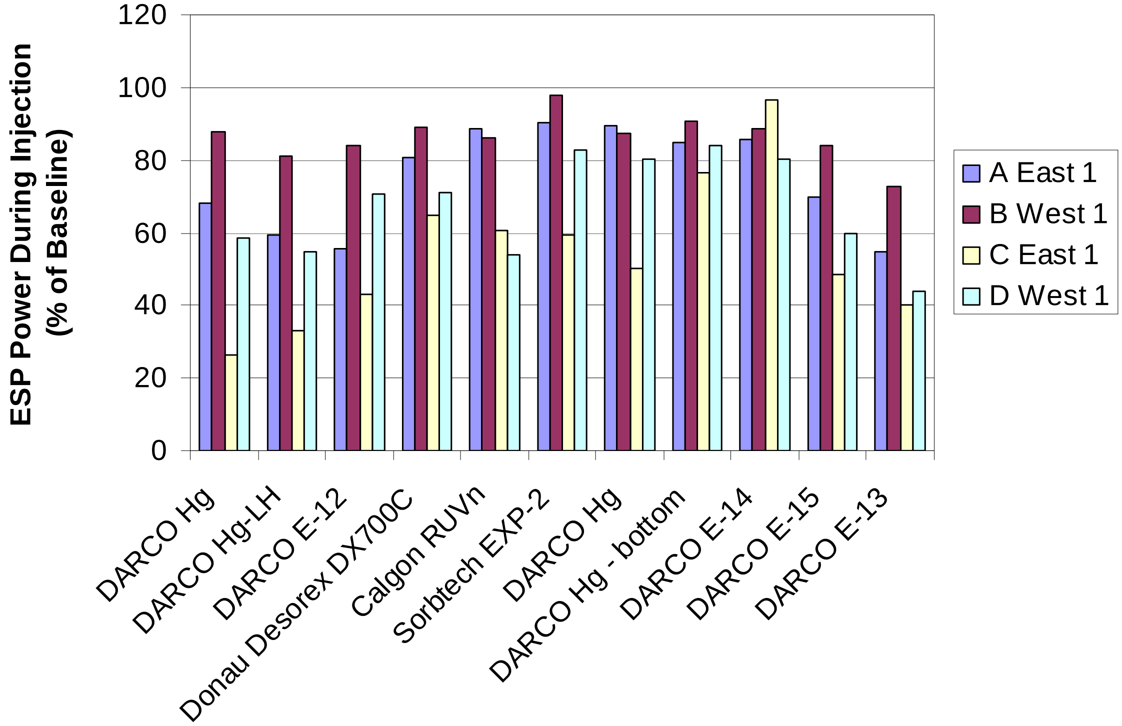


Figure 36. Relative ESP Power during Sorbent Injection—TR Sets A–D.

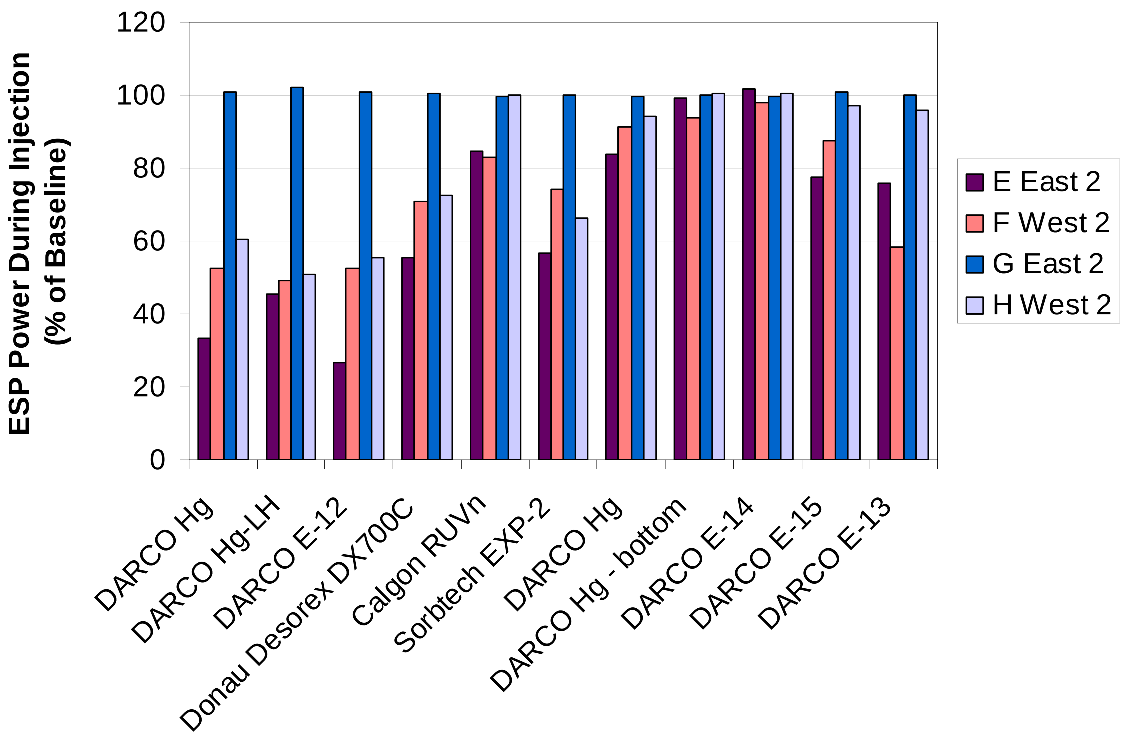


Figure 37. Relative ESP Power during Sorbent Injection—TR Sets E–H.

Duct Opacity

The instantaneous duct opacity was monitored closely during injection tests. The average duct opacity on the A-Side (west) and B-Side (east) ducts, for one hour before each injection period, and during the injection periods, are presented in Figure 38. As shown, DARCO® E-12, the sorbent with the highest mercury removal efficiency, also caused the largest increase in duct opacity (A-Side increased from 4.0% to 6.6% and the B-Side increased from 5.9% to 10.2%). The average opacity was unchanged or decreased when most of the other sorbents were injected. Although the opacity was relatively unchanged, the maximum opacity spikes increased significantly for several sorbents, especially when these materials were injected at concentrations greater than 10 lb/MMacf. These results are presented in Figure 39.

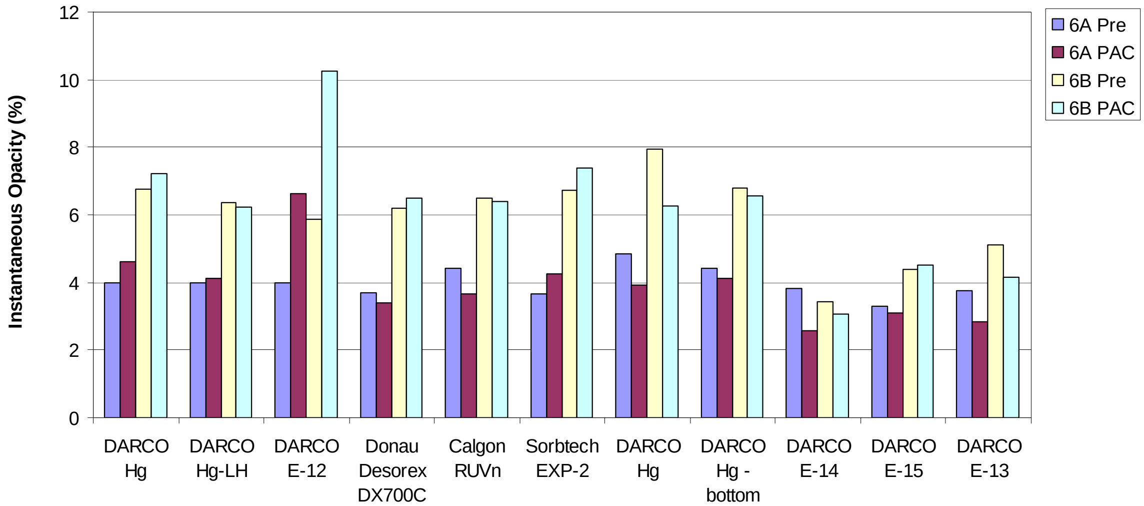


Figure 38. Average Duct Opacity One Hour Before and During Sorbent Injection Tests.

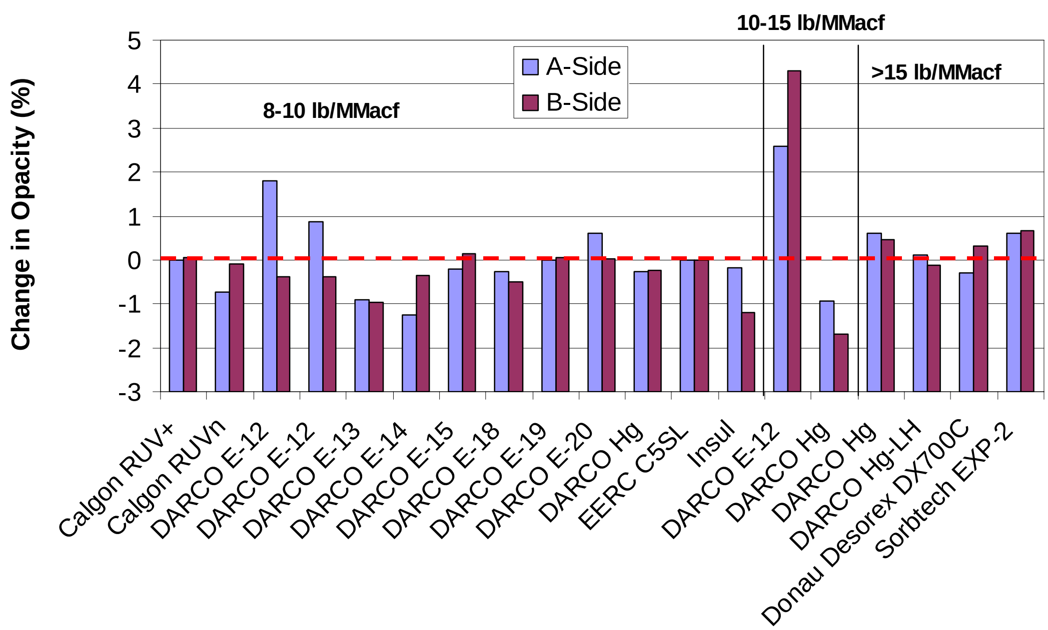


Figure 39. Change in ESP Outlet Opacity due to Sorbent Injection.

Ash and Carbon Analysis

Fresh samples of DARCO® Hg and DARCO® E-12 were sent to ISGS for surface area analysis along with fly ash samples collected in the inlet hoppers during injection of these sorbents. The results suggest that the surface area of the carbon fraction is reduced when exposed to Conesville flue gas. The data also suggest that DARCO® E-12 was affected less than DARCO® Hg. These data are presented in Table 17.

The ash and carbon data, in conjunction with the flue gas measurements mentioned previously, indicate that the sorbent capacity is altered by exposure to the flue gas at Conesville.

Table 17. Surface Analyses Results of PAC and Fly Ash + PAC.

Sample	LOI %	Sorbent %	SA m^2/g	SA of Mixture m^2/g C	SA of Sorbent m^2/g C
5474 DARCO® Hg	67	100	471.63	703.93	703.93
5471 DARCO® E-12	67	100	365.14	544.99	544.99
5242 Fly Ash Only	0.51	0	0.42	82.35	----
5389 Fly Ash + DARCO® Hg	3.29	4.18	12.40	376.90	433.02
5403 Fly Ash+ DARCO® E-12	2.90	3.59	13.00	448.28	528.53

Sorbent Screening Results and Discussion

Forty-six (46) materials were tested in three rounds of fixed-bed screening tests at Conesville using the SSDs. Thirty-six (36) samples were evaluated during the first round, seventeen (17) during the second round, and seven (7) during the third round. Some materials were tested in more than one round. An analysis of the results is included in this section along with a discussion of operating conditions that may have affected the results.

Non-Ideal Operating Conditions and Modifications to the SSD

To prevent SO_3 from condensing in the SSD sample lines during testing, care must be taken to heat all surfaces above the acid dew point temperature without increasing the temperature above the test temperature. A curve showing the acid dew point temperature in flue gas with 8 to 12% moisture is shown in Figure 40. For many sites, this is not an issue because the SO_3 concentration are low and slight variations in flue gas temperature will not cause the temperature to fall below the acid dew point temperature. At Conesville, however, even a small change in temperature below the extraction temperature (duct temperature) can result in a significant change in SO_3 concentration as the SO_3 reacts with moisture to form sulfuric acid droplets.

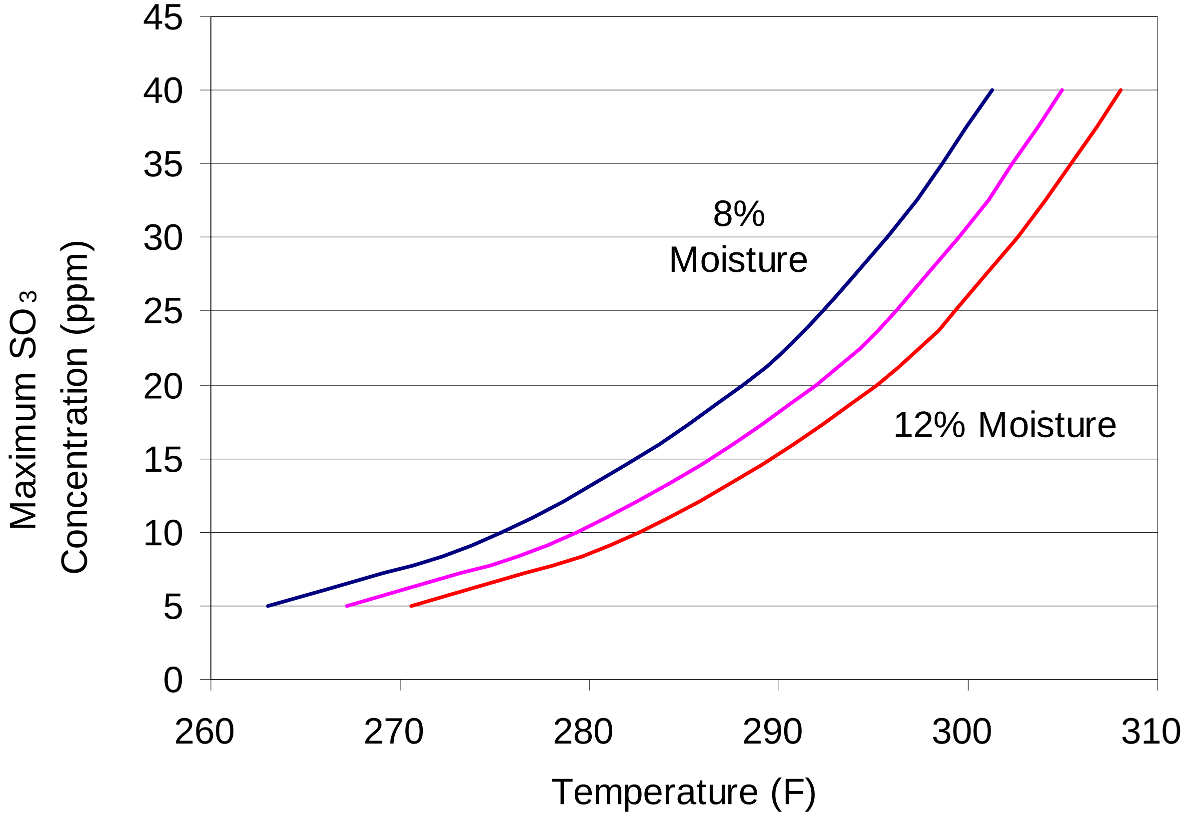


Figure 40. Acid Dew Point Curve at 8–12% Flue Gas Moisture.

During the first round of SSD tests, the sample probe was not heated adequately. At completion of the field tests, the inlet probe tubing was found to be more than half plugged with a greenish deposit, likely SO_3 and fly ash, at the point where the gas sample entered the unheated portion of the sample port nipple. A heated mantle was added to the inlet probe to prevent SO_3 condensation during the second round of tests. And even though all sample lines were installed within a heated enclosure, condensation was noted in the Teflon® tubing before the sorbent bed following the first two tests of the second round SSDs, which may have removed some of the SO_3 from the sample gas entering the beds. This tube was subsequently heat traced.

In addition to problems with temperature control, one of the two sampling consoles was malfunctioning during the second round of tests and the gas volumes recorded were not correct. Based on comparisons with the total mercury concentration measured with the second sampling console, the volumes recorded were often significantly below the actual volume. A post-test evaluation confirmed that the actual volumes were higher than those recorded by the gas meter.

Because of difficulties eliminating cold spots in Rounds 1 and 2, a third round of tests was conducted using a Thermo Hg CEM to monitor mercury concentrations downstream of the sorbent beds. Round 3 tests required installation of a larger sorbent bed on the tip of the sampling probe. Locating the sorbent bed on the tip of the probe prevented SO_3 condensation in the sample lines, as in Rounds 1 and 2.

Sorbent Test Results

Figure 41 shows the mercury concentration measured at the outlet of the sorbent bed from Round 3 testing as the test progressed. Data from Rounds 1 and 2 are not included because of sampling issues. During one test, the bed consisted only of sand (no sorbent) to assure that no removal was occurring in the system. For this test, the CEM measured the same mercury concentration as the ESP inlet CEM. Between tests, the sorbent bed was removed and the probe was reinserted so that measured mercury concentration could be compared to inlet CEM value.

The breakthrough curves shown in Figure 41 are indicative of ineffective sorbents. EPRI has conducted thousands of fixed-bed screening tests. The shape of the breakthrough curve for an effective sorbent would show a period of very low emissions followed by a rapid transition to breakthrough where the outlet concentration would equal the inlet concentration. For all Round 3 sorbents, there was a rapid transition to partial breakthrough (40 to 75%) followed by a long trend to full breakthrough.

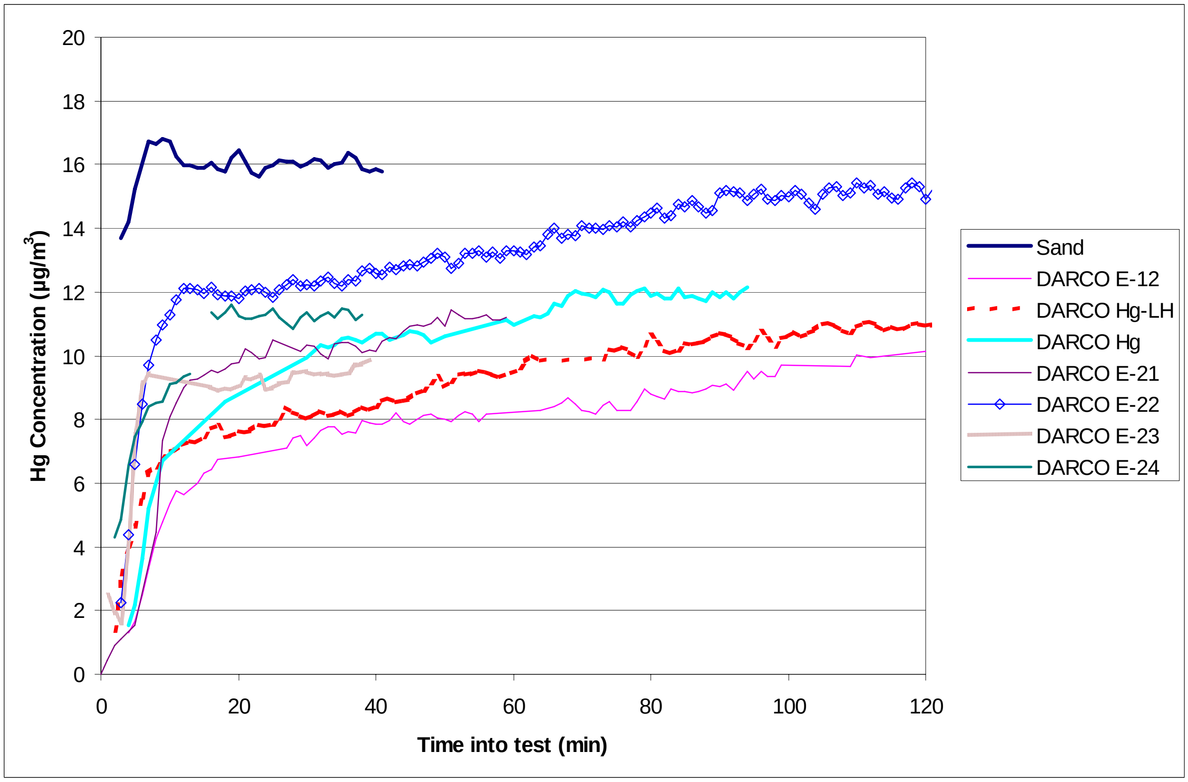


Figure 41. Mercury Removal Trends from Sorbent Screening Tests—Round 3.

The concentration data from the Hg CEM was further analyzed to determine the relative performance of the sorbents. Sorbent capacity is often reported as µg Hg captured per gram of sorbent, normalized to a duct mercury concentration of 50 µg/m^3. For most of the sorbents screened at Conesville, the test was terminated prior to reaching "equilibrium capacity" or the point where the sorbent is saturated and cannot remove additional mercury. For the data presented in Figure 41, the saturation point is defined when the mercury concentration at the outlet of the bed is equal to the inlet concentration.

Figure 42 presents the same set of data with the sorbent-to-gas ratio on the X-axis rather than the test time. The sorbent-to-gas ratio was multiplied by 5 in this figure as a rough estimate of the injection concentration that might be required at Conesville for similar mercury removal. The factor of 5 is based on the estimated effectiveness of sorbent injection upstream of ESP's versus upstream of a baghouse. The data suggests that all of the sorbents would require injection concentrations above the estimated 10 lb/MMacf to achieve 50% removal.

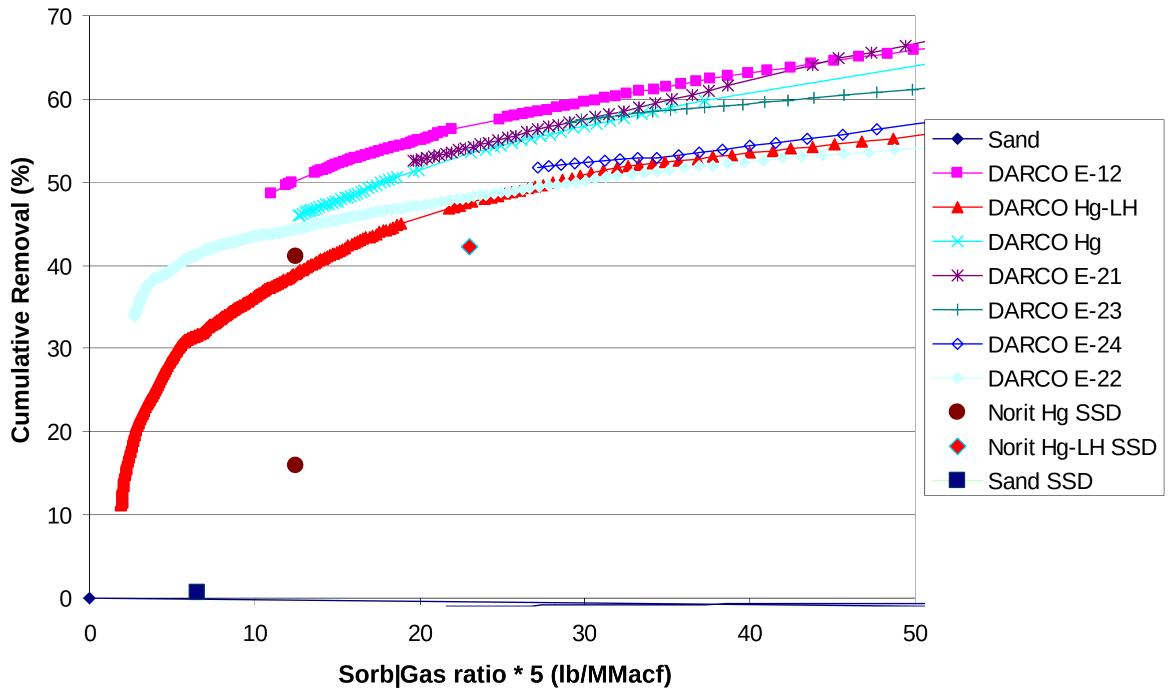


Figure 42. Cumulative Mercury Removal Compared to Sorbent-to-Gas Ratio. Note: Round 3 Tests are Trends; Round 2 are Single Points.

Three corrected runs from the Round 2 SSD tests are included in Figure 42 (as single points) for cross-reference. The Round 3 results indicate similar sorbent performance to the Round 2 results. The flow monitoring venturi on the Thermo CEM probe was not calibrated prior to the Round 3 tests and it is possible that the actual sorbent-to-gas ratio is slightly different from the value shown. Calibrations were conducted on this venturi in January 2006. Equipment to allow on-site calibration of the venturi was used prior to any additional SSD testing.

Two tests were allowed to run until the sorbents reached saturation (outlet concentration equaled the inlet concentration). The results indicate that the equilibrium adsorption capacities for these sorbents were:

DARCO® Hg-LH	121 µg Hg/g sorbent normalized to 50 µg/sm^3
DARCO® E-22	195 µg Hg/g sorbent normalized to 50 µg/sm^3

The data collected during Round 3 can be analyzed in numerous ways. The goal for the DOE project at Conesville is to achieve at least 50% mercury removal. Therefore, the mercury loading of the sorbents from the Round 3 tests at 50% cumulative mercury capture were calculated and are presented in Table 18. The mercury concentration in the Conesville flue gas can vary significantly. For illustration purposes, the sorbent-to-gas (S/G) ratio calculated at a concentration of 20 µg/sm^3 is included in the table. This was calculated using the following equation:

$S/G = 40.382(R)/S_R \times 50$

Where R = Fractional mercury removal = 0.5
S_R = mercury loading on sorbent at R Hg removal
1 µg/sm^3 = 40.382 E –6 lb/MMacf

The ratio of sorbent-to-gas ratio shown in Table 18 is expected to be similar to the sorbent required for full-scale injection into a fabric filter. The sorbent required for full-scale injection into an ESP is estimated to be between 5 to 10 times higher based upon previous full-scale tests. The estimated sorbent requirements are also included in Table 18.

Table 18. Summary of Sorbent Usage Projections for Conesville.

Sorbent	Cumulative Hg Collected in Bed (µg Hg/g sorbent normalized to 50 µg/sm^3 at 50% Hg removal)	Sorbent-to-gas ratio for 50% removal at 20 µg/sm^{3}lb/MMacf	Estimated Injection Concentration Required for 50% removal at 20 µg/sm^3 (= 5x sorb/gas ratio) lb/MMacf
DARCO® Hg-LH	59.1	17.1	85
DARCO® E-22	60.4	16.7	84
DARCO® E-24	69.6	14.5	73
DARCO® E-23	94.3	10.7	54
DARCO® Hg	96.7	10.4	52
DARCO® E-21	96.7	10.4	52
DARCO® E-12	162.4	6.2	31

SSD Compared with Full-Scale Injection Tests

Data from the full-scale injection tests are compared with the Round 2 SSD results in Figure 43. Not all full-scale results are included on this plot (several that were not tested in the SSD are omitted). The SSD data falls into the same range as the full-scale injection data. Note that the injection concentration shown for the SSD data is 5 times the sorbent-to-gas ratio.

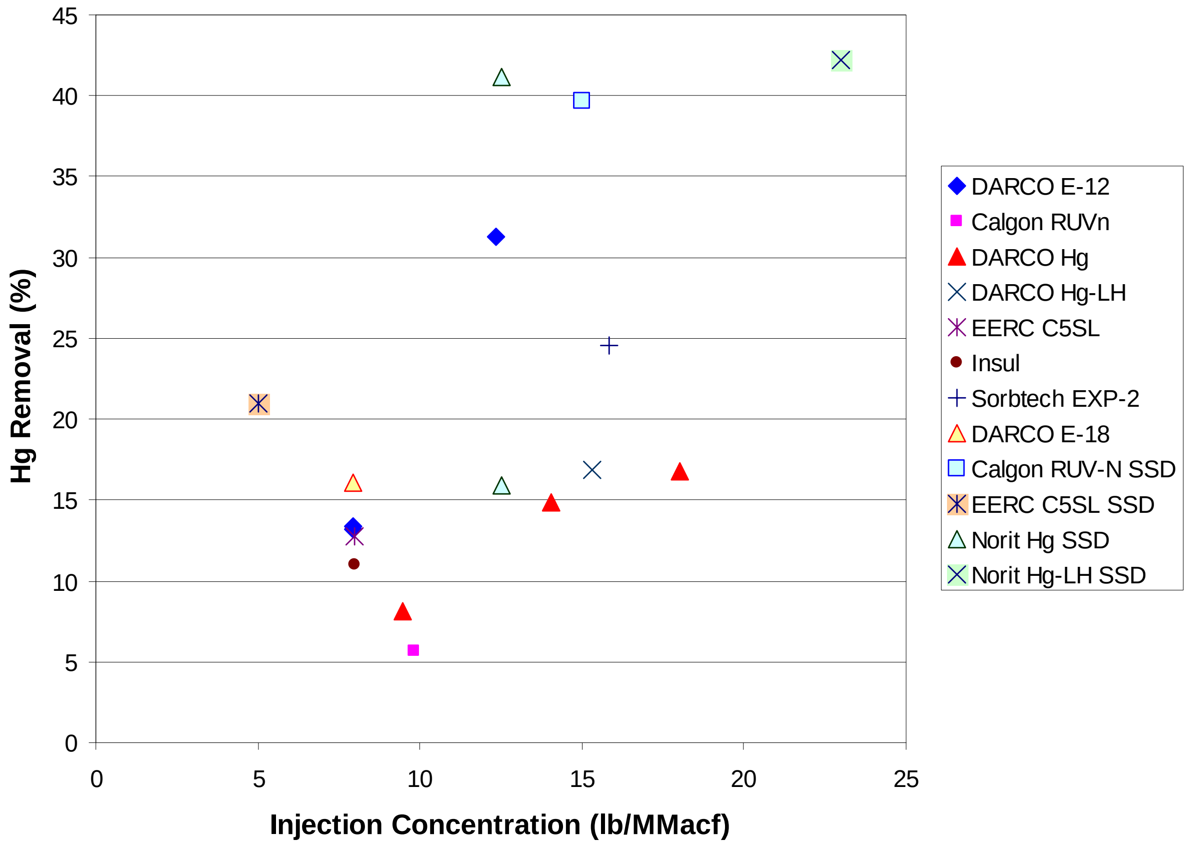


Figure 43. Comparison of Full-Scale Injection and SSD Results.

KNX Test Results

Prior to the start of KNX testing, the average total vapor-phase mercury concentrations at the inlet and outlet of the ESP were 25.7 μg/sm^3 and 24.7 μg/sm^3, respectively. The mercury concentration at the outlet to the WFGD was 7.2 μg/sm^3. This represents very little vapor-phase mercury capture across the ESP and 72% removal across the WFGD.

Figure 44 is the mercury trend graph over the course of KNX testing, with the start of KNX and DARCO® Hg injection indicated. Without sorbent injection, KNX alone did little to reduce ESP outlet mercury emissions. The combined mercury removal across the ESP and WFGD increased from 72% to 76% with KNX only. During DARCO® Hg injection, only half of the unit was treated. Mercury was monitored downstream of the WFGD on the side without carbon injection. Thus, the mercury emissions at the outlet of the WFGD did not change when sorbent injection began.

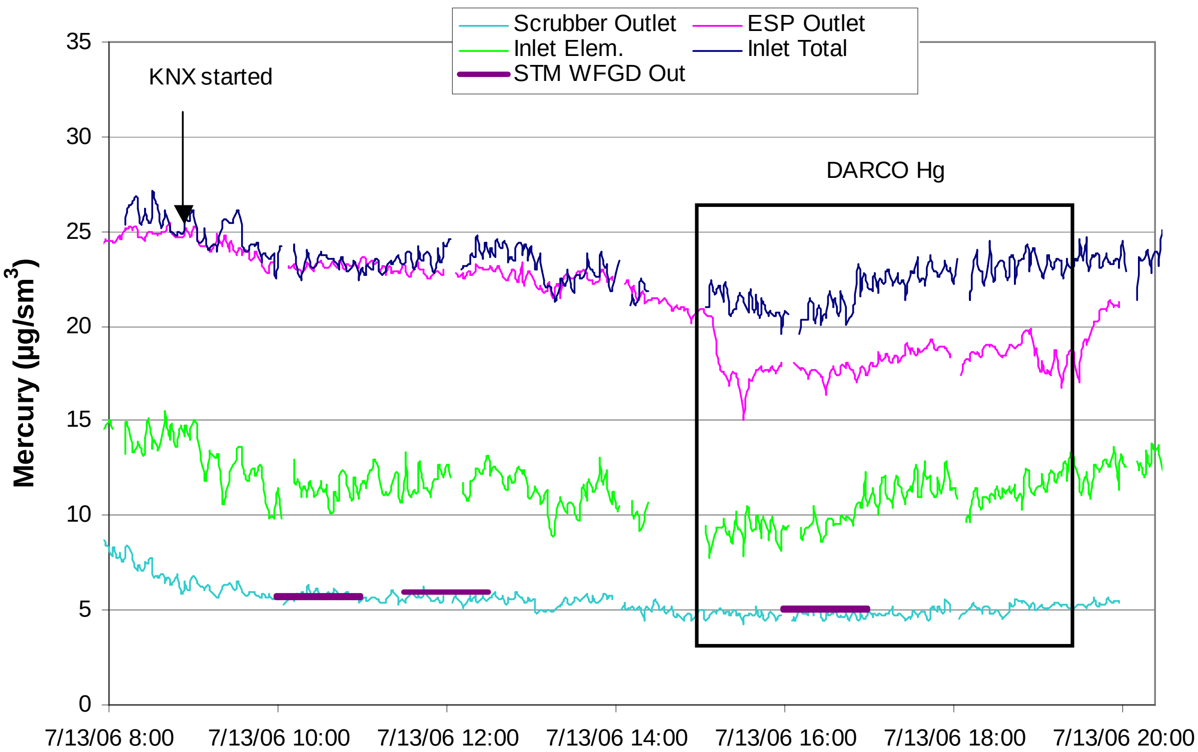


Figure 44. Trend Graph of Mercury Emissions during KNX Testing.

At 8 lb/MMacf DARCO® Hg and with KNX addition to the coal feed at 11.6 gph, the average incremental mercury removal across the ESP was 15.6%. This is approximately the same amount of mercury removal achieved with nearly twice the loading of DARCO® Hg-LH. However, it is still well below the target of 50% removal.

Speciation measurements during KNX testing were made at the ESP inlet. Prior to KNX injection, the fraction of oxidized mercury at the ESP inlet was 40 to 50%. During KNX injection, the average fraction of oxidized mercury at the inlet of the ESP was nominally 50%. No speciation measurements were made at the outlet of the ESP during this test period. Since the WFGD cannot remove elemental mercury and over 70% mercury removal was measured across the WFGD, it is possible that there was either some oxidation across the ESP, or the inlet CEM was not reporting the correct fraction of elemental mercury. STM measurements at the WFGD outlet agree with the CEM at this location.

DISCUSSION AND RECOMMENDATIONS

One of the overall objectives for Conesville was to find a sorbent(s) that could achieve 50 to 70% mercury removal across the ESP in the high-sulfur flue gas. Over forty sorbents from multiple vendors, many specifically formulated to address a high-sulfur environment, were tested in the SSD and eighteen injected at full-scale. None of the sorbents tested at Conesville achieved the target mercury removal at full-scale nor during the Round 3 SSD tests. It is thought that the relatively high SO_3 concentration in the flue gas may be interfering with mercury capture by the sorbents. General observations and conclusions from testing conducted at Conesville include:

- Native (baseline) mercury levels and removal:
  - ESP native mercury capture is very low at Conesville, from 0 to 20%. The mercury is 60 to 70% oxidized at the ESP outlet (upstream of the WFGD) and 90% elemental at the WFGD outlet.
  - Most of the oxidized mercury is removed in the WFGD.
  - Mercury ranges from 13 to 33 lb/TBtu at the ESP.
- Parametric Testing:
  - Most of the eighteen sorbents tested at full-scale increased T/R set spark rates, decreased power levels, and/or impacted opacity.
  - Several sorbents demonstrated some improvement over the benchmark sorbent, DARCO® Hg.
  - The maximum incremental removal by a sorbent was approximately 31% (DARCO® E-12 at 12 lb/MMacf). The next highest removal was 25% (Sorbent Technologies EXP-2 at 16 lb/MMacf). Both of these sorbents had an opacity impact that would require further evaluation.
  - Changing the injection lance design did not improve mercury removal.
  - Injecting the coal additive KNX resulted in a marginal improvement in the mercury removal across the ESP + WFGD from 72 to 76%.
  - Mercury removal using the benchmark sorbent increased from 8% at 9.5 lb/MMacf DARCO® Hg to 15.6% at 8 lb/MMacf DARCO® Hg when injected with the coal additive KNX.
- Options for improving performance:
  - Improved sorbents
  - Control SO_3, possibly with alkali co-injection
  - Inject PAC upstream of APH
- The mercury CEM installed at Conesville demonstrated extended, unattended operation with fairly reliable performance.
- The total mercury from STM tests have compared favorably with CEM measurements. At both the ESP inlet and outlet locations, and on the east and west sides, directly comparable samples are within 10%, with few exceptions.

The challenges identified and characterized at Conesville stemming from the high concentration of SO_3 in the flue gas may represent a larger obstacle to mercury control for the industry than just units that fire high-sulfur coal. The presence of SO_3 in flue gas appears to decrease mercury capture by activated carbon, sometimes dramatically. SO_3 may be present in sufficiently high concentration in several common plant configurations including low-sulfur units using SO_3 for flue gas conditioning and units where an SCR converts sufficient SO_2 to SO_3. Although some sorbents performed better than the benchmark sorbents, DARCO® Hg and DARCO® Hg-LH, in general the sorbents tested at Conesville did not show significant mercury removal. However, the more promising sorbents may perform well in plant configurations with slightly lower SO_2 and/or SO_3 in the flue gas.

A goal of this DOE/NETL program is to achieve 50 to 70% mercury capture across the ESP. Because this goal was not reached at Conesville, the test team recommended to DOE that testing be continued at Ameren's Labadie Power Plant, a site firing PRB coal and using SO_3 for flue gas conditioning. Testing at Labadie has been completed and results provide additional insight into the impact of lower levels of SO_3 (5 to 10 ppm) on PAC performance. Labadie test results will be published in U.S. DOE Cooperative Agreement No. DE-FC26-03NT41986 Topical Report No. 41986R25, 2008. Additional testing was also conducted by ADA-ES through DOE contract DE-FC26-06NT4278 at Public Service of New Hampshire's Merrimack Station, a site that fires a low- to medium-sulfur coal and uses an SCR for NO_X control. The SCR at Merrimack converts some of the SO_2 to SO_3 so that the resulting flue-gas SO_3 concentration is typically over 10 ppm.[1] Results from testing at Merrimack indicate that if the SO_3 concentration can be reduced, such as by injecting Trona to remove the SO_3, mercury removal in excess of 70% can be achieved. Because some of the alkali-treated sorbents impacted ESP performance and opacity at Conesville, additional testing at a site like Conesville would be required to determine whether the SO_3 concentration could be significantly reduced without impacting ESP operation.

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APPENDIX A: Conesville Test Plan

DOE NATIONAL ENERGY TECHNOLOGY LABORATORY MERCURY FIELD EVALUATION

Evaluation of Sorbent Injection for Mercury Control at AEP's Conesville Power Plant

Draft Test Plan

Prepared for:
AEP
DOE NETL
EPRI

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Littleton, CO 80120

March 17, 2006

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Project Objectives

The objective of testing at AEP's Conesville Power Plant is to determine the cost and effects of sorbent injection for control of mercury in stack emissions. Conesville Power Plant is located near Coshocton, OH. The project will evaluate the effects of sorbent injection on an electrostatic precipitator (ESP) and wet flue gas desulphurization (wet-FGD) scrubber on mercury speciation and sorbent performance. Tests are planned for the 400 MW Unit 6.

Project Overview

This test is part of an overall program funded by the Department of Energy's National Energy Technology Laboratory (NETL) and industry partners to obtain the necessary information to assess the feasibility and costs of controlling mercury from coal-fired utility plants. Host sites that will be tested as part of this program are shown in Table 1. These host sites reflect a combination of coals and existing air pollution control configurations representing 78% of existing coal-fired generating plants (approximately 950 plants producing a combined 245,000 MW) and potentially a significant portion of new plants. These four host sites will allow documentation of sorbent performance on the following configurations:

Table 1. Host Sites Participating in the Sorbent Injection Demonstration Project

	Coal / Options	APC	Capacity (MW) / Test Portion	Current Hg Removal (%)*
Sunflower Electric's **Holcomb Station**	PRB & Blend	SDA – Fabric Filter	360 / 180 and 360	<15
Basin Electric's **Laramie River Station**	PRB	SDA - ESP	550/138	<10
DTE Energy's **Monroe Station**	PRB – E. Bit. Blend	SCR - ESP	785/196	<50
AmerenUE's **Meramec Station**	PRB	ESP	140 / 70	<25
American Electric Power's (AEP) **Conesville Station**	Bituminous	ESP + Wet FGD	400 / 400	~50

Conesville Unit 6 was chosen as part of this evaluation because it fires a high sulfur bituminous coal and is configured with an ESP followed by a wet-FGD. This combination will allow an evaluation of the effects of higher sulfur levels on the mercury removal performance of injected sorbents and the impact of injected sorbents on the performance of the ESP and wet-FGD. During testing, firing a blend of subbituminous Power River Basin coal (PRB) is scheduled to determine if the native mercury removal or mercury removal with injected sorbents can be improved.

Host Site Description: Conesville Unit 6

AEP's Conesville Power Plant is located near Coshocton, OH. The Unit 6 boiler is a 400 MW Combustion Engineering (ALSTOM) designed tangential fired PC unit that normally fires high sulfur eastern bituminous coal. The unit is equipped with cold-side Research Cottrell ESPs. Flue gas is drawn through the ESPs via ID fans. The ID fans discharge flue gas into two Universal Oil Products wet lime absorber modules. The modules have partial bypass capability and have been retrofitted with a B&W tray design. The system is typically operated with the bypassed closed. The bypass valves have a design leak rate of 5% of the flow. A sketch of the unit layout is presented in Figure 1. Testing is planned for the entire 400 MW unit.

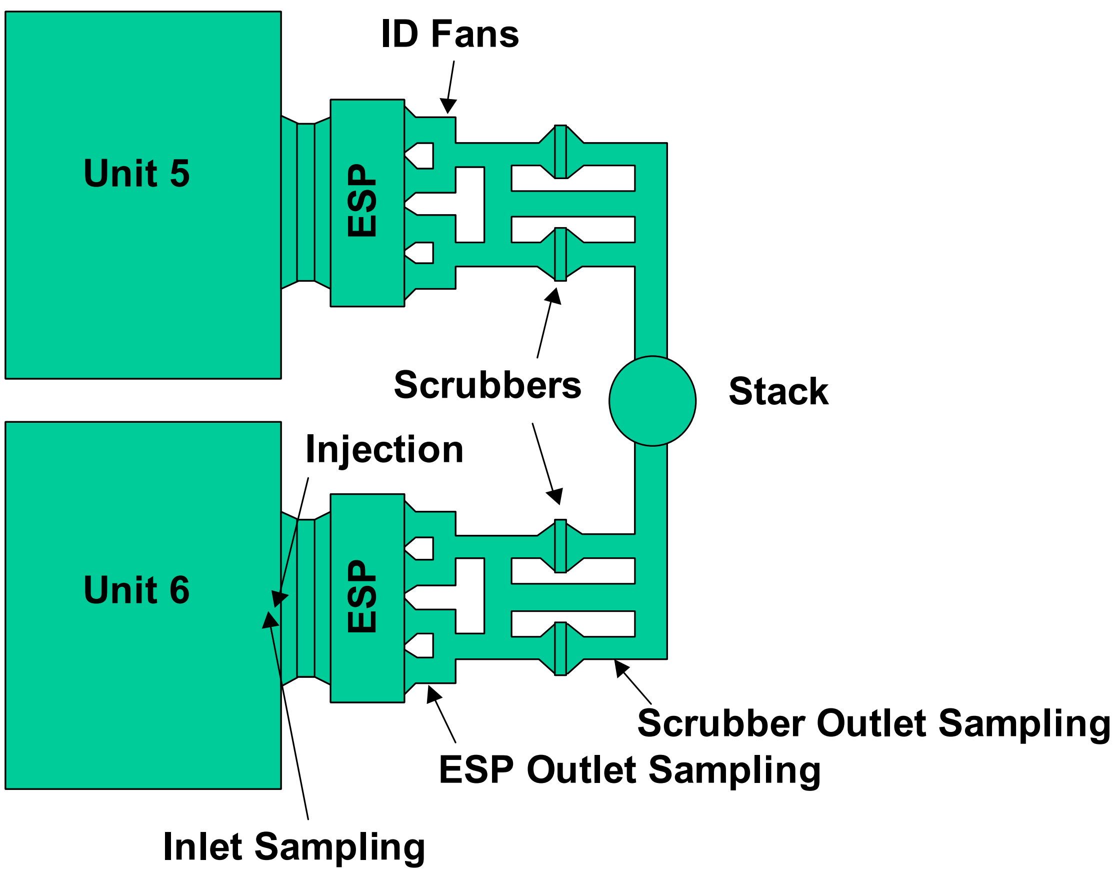


Figure 1. Layout sketch of Conesville Units 5 and 6

Table 2. Conesville Key Operating Parameters

Unit	6
Size (MW)	400
Test Portion (MWe)	400
Coal	High sulfur Ohio Basin Bituminous
Heating Value (as received)	11,020
Sulfur (% by weight)	3.31
Chlorine (ppm dry)	273
Mercury (ppm dry)	0.381
Particulate Control	Cold Side ESP SCA = 301 ft^2/kacfm
Sulfur Control	Wet FGD
Ash Reuse	FGD Sludge Stabilization

General Technical Approach

Activities at each test site in this program are divided into the seven tasks shown in Table 3. These tasks provide the outline for the test plan.

Table 3. Site-Specific Tasks

Task	Description
1	Host site kickoff meeting, test plan, and sorbent selection
2	Design and installation of site-specific equipment
3	Field Tests
3.1	Sorbent selection
3.2	Sample and data coordination
3.3	Baseline tests
3.4	Parametric tests
3.5	Long-term tests
4	Data analysis
5	Sample evaluation
6	Economic analysis
7	Site report

Task 1. Host Site Planning and Coordination

Efforts within this task include planning the site-specific tests with AEP and Conesville Power Plant, DOE/NETL, and contributing team members. ADA-ES visited the site on November 13, 2004 to discuss potential equipment and port locations. Additional communications between ADA-ES and AEP personnel have been conducted to discuss topics such as the plant operation, port and silo installation, and host site agreements. The host site agreement, installation document, and test plan will be finalized during this task. Other efforts include identifying any permit requirements, finalizing the site-specific scope for each of the team members, and putting subcontracts in place for manual (Ontario Hydro, M26a, etc.) sampling services. A site kickoff meeting was held on March 1, 2005.

The host site will be responsible for preparing sampling and injection ports prior to testing. A document describing the new port locations and port specifications will be delivered to plant personnel during the site kickoff meeting and was finalized following a duct inspection during the outage in April, 2005. Installation of the new test ports was completed in the fall, 2005.

The site will also be responsible for obtaining samples of coal, ash, FGD sludge, and other solid and liquid samples during the testing program. A sample management plan describing what samples will be collected and their frequency of collection will be issued following the pre-test meeting on February 7, 2006. Coal samples will be collected "as received" from the trains arriving at the plant. As coal is received at the plant, it is typically fed directly to the bunkers. If during testing, coal is brought into the bunkers from the coal pile, the belt delivering coal to the bunkers will be stopped periodically to collect an across-the-belt sample. Ash samples will be required from multiple ESP hoppers to identify variations in mercury and carbon throughout the ESP (front-to-back and side-to-side).

Sorbent Selection

A key component of the planning process for these evaluations is identifying potential sorbents for testing. The test program allows for the evaluation of up to three different sorbents. DARCO Hg, a lignite-derived activated carbon supplied by NORIT is considered the benchmark for these tests because of its wide use in DOE and EPRI-sponsored testing. Potential alternative sorbents include those that may be more effective than DARCO Hg, or sorbents that are effective but cost less per pound. Examples that have demonstrated improved effectiveness on high sulfur sites will be considered. Sorbent vendors and developers have been invited to submit proposals for inclusion of their sorbents in the program. Sorbents were screened in November 2005 and February 2006. Sorbents will be chosen for parametric testing based upon results from screening tests, and a review of relative sorbent costs and availability and potential balance-of-plant impacts.

Task 2. Design, Fabricate, and Install Equipment

Site-specific equipment includes the sorbent distribution manifold and sorbent injection lances. These must be designed and fabricated for each test site. Other equipment, such as the injection feeder/silo and mercury analyzers are used at all sites. Required site support at Conesville includes installation of required ports, platforms and scaffolding, supplying compressed air and electrical power, wiring plant signals including boiler load to the silo control panel, and balance of plant engineering. Table 4 presents a representative split of responsibilities on key equipment and activities between ADA-ES and Conesville. A foundation for the silo will also be required. ADA-ES engineers worked with plant engineers to develop an installation package, and worked with the construction crew during installation activities.

Table 4. Scopes of Work for Sorbent Injection System

ADA-ES Transportable System	Provided by Host Site
Injection Silo and Feeder	Foundation and power
Sorbent Injection System	Injection ports
Sorbent Distribution Manifolds	Test ports
Conveying Hose (400 ft)	Access platforms
Sorbent Injectors	Installation labor
PLC Controls	Compressed air
Hg CEMs	Power, Compressed Air
Office Trailers (est. 3)	Signal Wiring / Telephones / Power

ADA-ES will oversee installation and system checkout of the mercury control equipment. If necessary, ADA-ES is capable of taking responsibility for all phases of the installation, except for final connections into plant utilities. ADA-ES will work with Conesville personnel to assure that the equipment is installed in an efficient manner, within the resources available at the site.

ADA-ES will be responsible for the final checkout of all systems and for the general maintenance of the systems during testing. At least one engineer or technician who is solely dedicated to the operation of the equipment will be on-site or on-call for all tests. The actual equipment installation, not including preparation tasks, is estimated to take two weeks. This includes time for checkout and troubleshooting. ADA-ES will also install the mercury monitors at Conesville.

Conesville will be responsible for all permitting and any variance requirements. ADA-ES can assist by providing information to or meeting with regulatory agencies as required.

Sorbent Injection System Description

The carbon injection system, shown installed at Holcomb in Figure 2, consists of a bulk-storage silo and twin blower/feeder trains. PAC is delivered in bulk pneumatic trucks and loaded into the silo, which is equipped with a bin vent bag filter. From the discharge section of the silo, the sorbent is metered by variable speed screw feeders into eductors that provide the motive force to carry the sorbent to the injection point. Regenerative blowers provide the conveying air. A PLC system is used to control system operation and adjust injection rates. The unit is approximately 50 feet high and 10 feet in diameter with an empty weight of 10 tons. The silo will hold 20 tons of sorbent. Flexible hose carries the sorbent from the feeders to distribution manifolds located on the flue gas ducts, feeding the injection probes. Each manifold supplies up to six injectors.

A sketch of the ESP inlet at Conesville showing the injection port locations is shown in Figure 3. Flow modeling studies completed by REI suggest that the lance arrangement will provide good sorbent distribution into the ESP.

Figure 2. Carbon Injection Storage Silo and Feeder Trains Installed at Holcomb

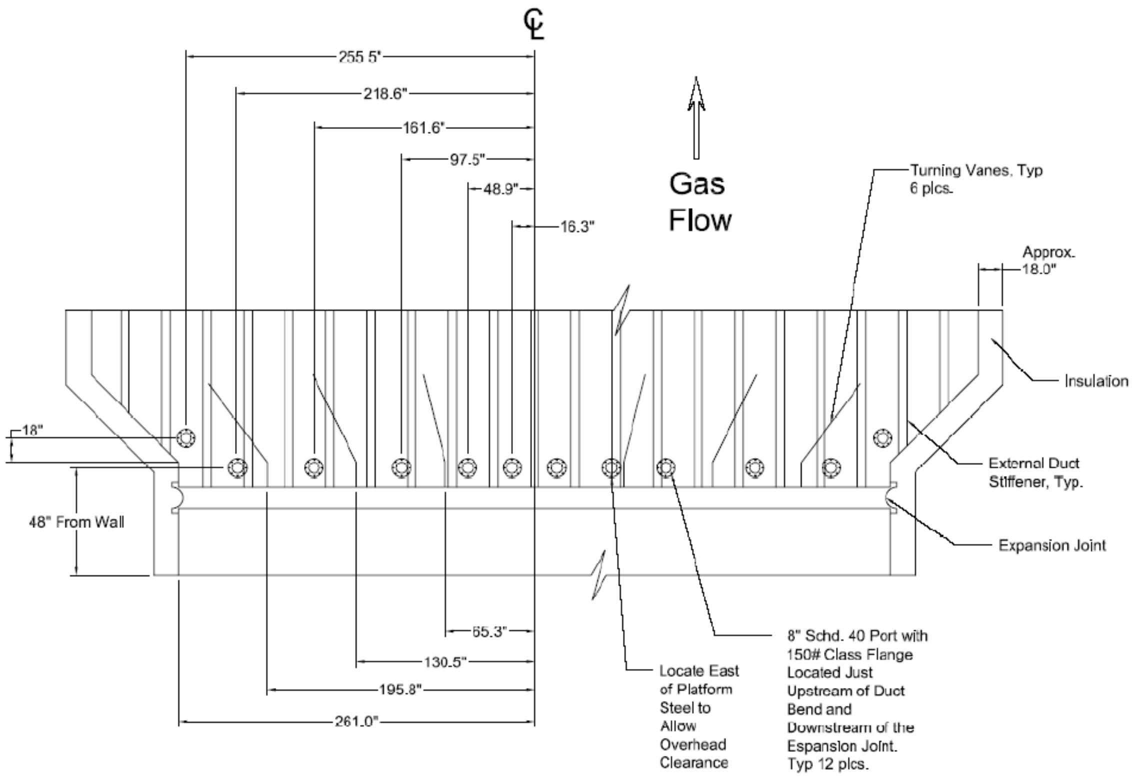


Figure 3. Injection port locations on the Conesville Unit 6 ESP inlet duct

Mercury CEM Description

The Thermo Electron *Mercury Freedom System™* CEM has been chosen for flue gas mercury measurements at Conesville. Three key components of the CEM are the sample extraction probe/converter, the mercury analyzer, and the calibration module. These are described briefly below and presented in Figure 4, a schematic of the entire system, showing the key components and other supporting instrumentation.

- **Sample Extraction Probe/Converter**. An inertial filter is used to separate a particulate-free vapor-phase sample while minimizing the interactions with fly ash, which can cause sampling artifacts. The sample is immediately diluted with pre-heated dilution air to minimize mercury reactions with other flue gas species.

- **Mercury Analyzer**. Mercury is measured directly in the analyzer using Cold Vapor Atomic Fluorescence Spectroscopy (CVAFS). There is no cross interference from SO_2 with CVAFS. Because the sample is diluted, it has low moisture, is relatively non-reactive and therefore has minimal interference from other gases.

- **Calibration Module**. The calibrator module incorporates a mercury source in a temperature-controlled chamber that can be heated or cooled to maintain the source at a precise temperature. The operator can program the calibrator to deliver zero or span gas to the analyzer, to the sample port between the inertial filter and the critical orifice, or upstream of the inertial filter.

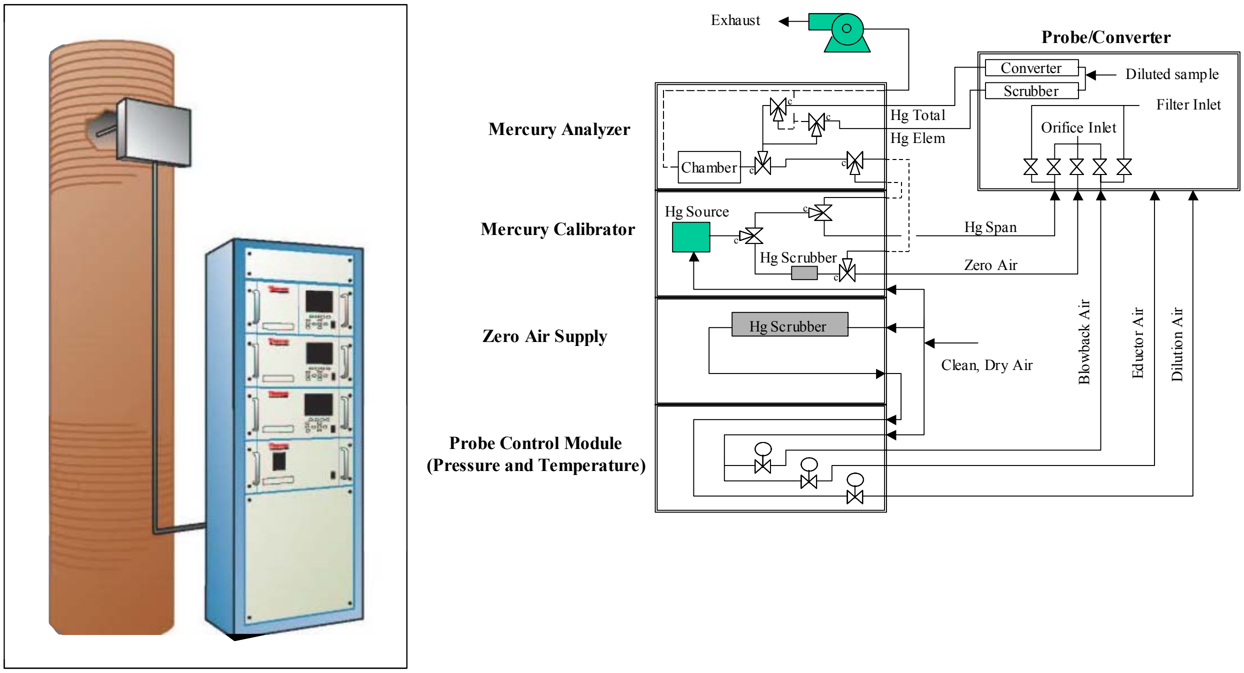


Figure 4. Thermo Electron Mercury Freedom System™.

At least two mercury monitors will be used during this testing program to provide real-time feedback during baseline and sorbent injection testing. The analyzers are capable of measuring both total vapor-phase mercury and elemental vapor-phase mercury. The analyzer determines total vapor-phase mercury concentrations by reducing all of the oxidized mercury to the elemental form near the extraction location. To measure elemental mercury, the oxidized mercury is removed while allowing elemental mercury to pass through without being altered.

Task 3. Field Testing

The field tests will be accomplished through a series of five (5) subtasks. The subtasks are independent from each other in that they each have specific goals and tests associated with them. However, they are also interdependent, as the results from each task will influence the test parameters of subsequent tasks. A summary of each task is presented.

The various tests are described below in their corresponding subtask. Exact operating conditions are subject to change based on the results from baseline and sorbent screening tests.

Subtask 3.1 Sorbent Selection

The sorbent screening device (SSD) is an extractive system designed to predict mercury removal performance in a full-scale ESP. A sketch showing major components and plant requirements is shown in Figure 5. The test apparatus consists mainly of the probe box and two stack sampling boxes. The probe box mounts directly to a 4-inch, flanged sample port and contains an inertial filter, gas eductor and two sorbent test trains each consisting of a test bed and an activated carbon trap

The test beds consist of sand mixed with sorbent and ash in amounts representative of the ESP inlet particulate loading at the host site. The inertial separation probe separates the native fly ash from the sampled flue gas stream prior to the test beds. AC-traps are located downstream of the test beds and are used to collect any mercury not trapped by the test beds. Once the tests trains are installed and leak-checked, the assembly is heated (the inertial filter is maintained at 400°F and the tests beds are maintained at the flue gas temperature at the test location) and flue gas is drawn through the assembly for a test period that typically lasts two hours for ESP studies. Upon subsequent analyses, the mercury collected in the test beds and carbon traps can be used to determine the mercury removal efficiency of the sorbent. The inlet mercury concentration is calculated as the sum of the mercury in the test bed and carbon trap, and mercury removal is the amount in the test bed divided by the inlet mercury.

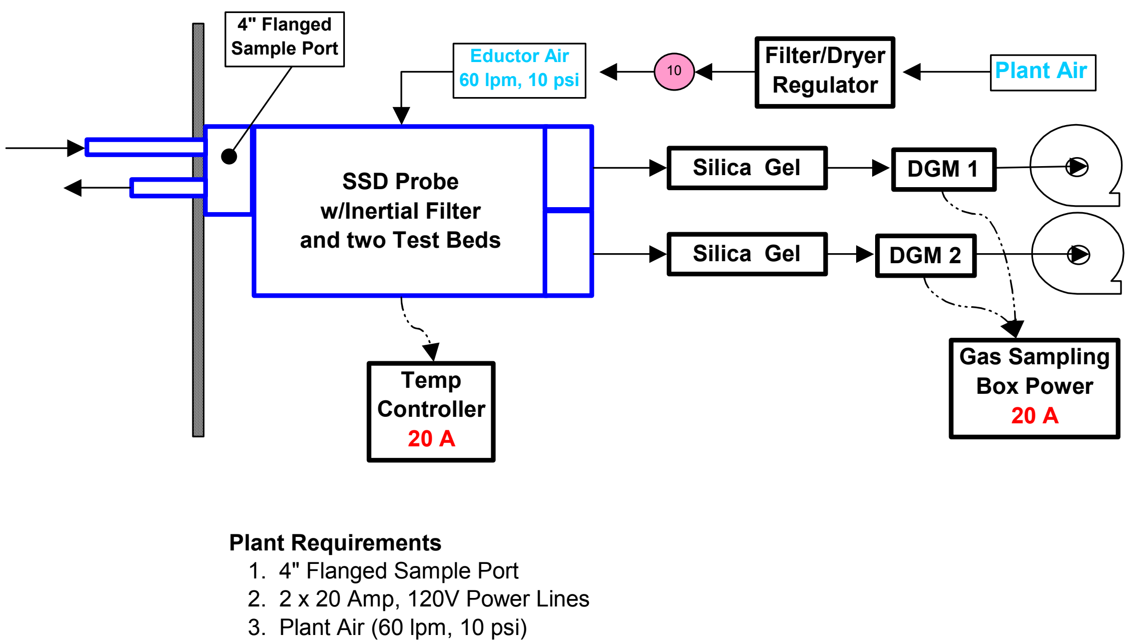


Figure 5. SSD Components and Power Requirements

Subtask 3.2 Sample and Data Coordination

ADA-ES engineers will coordinate with plant personnel to retrieve the necessary plant operating data files on a daily basis during testing. An example of the operating data is included in Table 5, along with other samples and measurements that will be collected. These data will be integrated into the sorbent injection and mercury control database. ADA-ES site engineers will work closely with plant operators to monitor key plant operating parameters in real-time during testing. If at any time the performance of the existing pollution control equipment or outlet emissions exceed acceptable operating limits, testing will be halted. Acceptable limits will be discussed and agreed upon prior to beginning injection.

The primary extraction locations for the mercury monitors will be upstream and downstream of the ESP. Periodic measurements will also be made downstream of the WFGD. The extraction port and probe length will be identified after a velocity and temperature traverse at the sampling locations are conducted to identify an appropriate, single-point position. The position will be at a duct average temperature and velocity. Experience has shown that this should be representative of the duct average mercury concentration.

Manual mercury samples using ASTM M6784-02 (Ontario Hydro Method) will be collected at the ESP inlet and wet FGD outlet locations. Because of the influence of HCl, HF, and SO_3 on sorbent effectiveness, Method 26a measurement (HCl and HF) and controlled condensate measurements (SO_3) will be made during the same sampling campaign as the Ontario Hydro samples will be collected to better characterize the flue gas. The outlet particulate emissions are a key parameter to assess the impact of carbon injection on ESP performance. Therefore, particulate emission measurements will be made with EPA Method 5 or 17 at the inlet and outlet of the ESP. Activated carbon has been shown on previous tests to be effective at removing other metals. Therefore, EPA Method 29 measurements will also be made. Three sampling runs of each test method will be conducted over the baseline test week. It is anticipated that AEP's in-house sampling team will conduct the manual source testing.

ADA-ES engineers will also develop a sample Chain-of-Custody and coordinate with host plant personnel to assure coal, ash, and other samples are collected and tracked properly. A tentative sample collection schedule is presented in Table 6. The final schedule will be agreed upon prior to beginning baseline testing. The hopper numbers referenced in Table 6 are included on the hopper diagram in Figure 6.

Grab samples of ash will be collected from the ESP hoppers each day of testing. Samples will be segregated by the test condition (baseline, each parametric test, and long-term test). The samples will be stored in 1-liter or 5-gallon sample containers for shipping to analytical laboratories. The schedule indicates sampling from multiple rows in the ESP. These samples will be used to determine if stratification exists throughout the system.

Tests will also be conducted to determine the effect of activated carbon injection on scrubber performance. In particular, tests will be conducted to determine changes in settling and dewatering performance as a result of carbon injection. The specific tests will be identified following discussing with AEP laboratory personnel.

Gas Flow **Gas Flow**

32	31	30	29	28	27	26	25
24	23	22	21	20	19	18	17
16	15	14	13	12	11	10	9
8	7	6	5	4	3	2	1

East ESP **West ESP**

*Sampled Hopper

Figure 6. Hopper Diagram

Table 5. Data Collected During Field Testing

Parameter	Sample/signal/test	Baseline	Parametric/ Long-Term
Coal	Batch sample	Yes	Yes
Coal	Plant signals: burn rate (lb/hr) quality (lb/MMBTU, % ash)	Yes	Yes
Fly ash	Batch sample	Yes	Yes
Scrubber Slurry	Batch sample	Yes	Yes
Unit operation	Plant signals: boiler load, etc.	Yes	Yes
Temperature	Plant signal at AH inlet and ESP inlet/outlet	Yes	Yes
Temperature	Full traverse ESP inlet, single port traverse from each ESP outlet duct	Yes	No
Duct Gas Velocity	Full traverse at ESP inlet/outlet	Yes	No
Mercury (total and speciated)	Hg CEMs at ESP inlet/outlet	Yes	Yes
Mercury (total and speciated)	ASTM M6784-02 (Ontario Hydro) at ESP inlet/outlet, WFGD outlet	Yes (1 set)	No/Yes (2 sets)
Multi-Metals Emissions	Method 29 at ESP inlet/outlet	Yes, outlet	No/Yes, outlet
Particulate Emissions	EPA Method 17 TEOM continuous particulate monitor	Yes Yes	Yes Yes (par.)
HCl, HF, Br	EPA Method 26a at ESP inlet/outlet	Yes	Yes
SO_3	Controlled Condensate	Yes	Yes
Sorbent Injection Rate	PLC, lbs/min	No	Yes
Plant CEM data (NO_x, O_2, SO_2, CO)	Portable monitor at ESP outlet location	Yes	Yes
Stack Opacity	Plant data – WFGD inlet	Yes	Yes
Pollution control equipment	Plant data (Sec mA, Sec. Voltage, Sparks, slurry feed rate, etc…)	Yes	Yes

Table 6. Tentative Sample Collection Schedule

Test Condition	Type	Frequency	Volume Collected
Baseline and Long Term	Coal	Daily	1 liter
	ESP Ash	Daily: One Hopper Each Field, Middle Row (e.g.4,12,20,28) 2 samples per week Four Inlet hoppers (26,28,30,32) 2 sample per week during source testing: Four Inlet hoppers (26,28,30,32) Four Row 2 hoppers (18,20,22,24) Two Row 3 hoppers (10,12,14,16) Two Row 4 hoppers (2,4,6,8) Weekly: One Inlet Hopper (28) Ash Silo	1 liter 1 liter 3 liters* **5 gallon – Sample, each**
	Scrubber Samples	2 samples per week: Lime Feed, Flocculant Feed, Solid Byproducts, Liquid Byproducts	1 liter, each
	Bottom Ash	2 samples per week	1 liter
Parametric	Coal	Daily	1 liter
	ESP Ash	Daily: One Hopper Each Row, One Inlet Hopper on each side (4,12,20,28,30) High Inj. Conc per sorbent: Four Inlet hoppers (26,28,30,32) Ash Silo	1 liter 3 liter, each*

* If sample collection is possible

Subtask 3.3 Baseline Testing

Once the equipment is installed, one week of baseline testing (no sorbent injection) is scheduled. During the baseline testing series, mercury measurements will be made at the inlet of the ESP and outlet of the wet-FGD. These data will be used to characterize native mercury capture across the ESP and wet-FGD without sorbent injection. Unit operation will be set at conditions expected during the parametric tests. It is anticipated that boiler load will be held constant at full-load and that the air pollution equipment will be operated under standard full-load conditions. ASTM M6784-02 (mercury) measurements, EPA Method 29 (multi-metals) and Method 26A (HCl and HF) measurements will be conducted in conjunction with the mercury monitors during this subtask. Method 17 particulate samples and controlled condensate SO_3 measurements will also be collected during this subtask.

Subtask 3.4 Parametric Testing

Following baseline testing, three weeks of parametric testing are planned as shown in the test matrix on Table 7. The parametric tests will be conducted at full-load conditions to document sorbent injection requirements. Mercury measurements will be made during the parametric tests to characterize mercury capture with sorbent injection. During the parametric tests, sorbents will be injected at various rates to develop a relationship between sorbent injection concentration and mercury removal efficiencies across the ESP and wet-FGD. In addition to sorbent injection, the effects of temperature on sorbent effectiveness will be evaluated.

The first two weeks of parametric testing will evaluate the effects of sorbent injection for control of mercury in stack emissions. Seven sorbents are included in the schedule. These include DARCO Hg, a sorbent derived from a Texas-Lignite coal and manufactured by NORIT Americas. This sorbent has been tested in various lab, pilot, and full-scale mercury control demonstrations and is considered the benchmark for performance comparisons. DARCO Hg has a bulk density of 25-30 lbs/ft^3. The other sorbents tested, chosen based upon results from sorbent screening tests, are listed below.

Sorbent	Price/lb
Calgon RUV-N	\$0.74
Sorbent Technologies	\$0.75
Donau Desorex DX700C	\$0.42
Norit DARCO Hg	\$0.45
Norit DARCO Hg-LH	\$0.85
Norit DARCO E-12	\$0.55
Norit DARCO E-13	\$0.55

Initial parametric testing will consist of “screening” the sorbents by injecting at 6 lb/MMacf, or the maximum achievable continuous feed rate of the injection system, for 2 to 3 hours. If the maximum injection concentration is less than 6 lb/MMacf, all sorbents will be evaluated at the lower concentration. DARCO Hg and the top two performing sorbents will be characterized at lower injection concentrations at the end of the second week of parametric tests.

During the third week of parametric testing, the performance of the sorbent chosen for long-term testing will be further characterized in preparation for long-term testing. , Three target mercury removal levels will be identified by the test team. For the first two days of testing, the sorbent injection concentration will be increased until each removal level is achieved. Each injection concentration will be maintained for at least three hours. During days three through five, sorbent will be introduced at the long-term injection concentration while measuring the flue gas mercury at each of the four ESP outlet ducts. The temperature varies from nominally 325°F on the west side of the ESP to 375°F on the east side of the ESP. The Sorbent Trap Method (STM, Modified 40 CFR, Part 75, Appendix K) will be used in conjunction with the Hg CEMs during this week to collect additional stratification information.

After parametric testing is completed, the project team will evaluate the data collected to determine the optimum long-term testing conditions.

Subtask 3.5 Long-Term Testing

Long-term testing will be conducted at the "optimum" settings as determined by the project team based upon results from parametric tests and other considerations such as material cost and plant impacts. It is the intent of DOE that these settings represent the most cost effective condition for mercury removal. The goal of this task is to obtain sufficient operational data on removal efficiency over a 4-week period, the effects on the particulate control device, effects on byproducts, and impacts to the balance of plant equipment to prove viability of the process and determine the process economics. During this test, ASTM M6784-02, M29, M26A, M17, and controlled condensate measurements will be conducted at the inlet and outlet of the pollution control device.

This task is the single most important step in gaining acceptance from the utility industry as to the practical implementation of mercury removal technologies on coal-fired power plants.

Table 7. Proposed Full-Scale Test Sequence for Conesville Unit 6

Test Description	Start Date	Parameters/Comments	Boiler Load
Week 1: Baseline	3/13/06	Day 1 - Test crew set-up no restrictions on boiler load Day 2 – Manual Sampling[a] Day 3 – Manual Sampling[a] Day 4 – Manual Sampling[a] Day 5 - Manual Sampling[a]	Full Load[b] 24 hours per day
Week 2: Screening	3/20/06	Day 1 – DARCO Hg, 6 lb/MMacf Day 2 – DARCO Hg-LH, 6 lb/MMacf Day 3 – DARCO E-12, 6 lb/MMacf Day 4 – Calgon RUV-N, 6 lb/MMacf Day 5 – Donau DX700C, 6 lb/MMacf	Full Load 6AM-6PM
Week 3: Screening	3/27/06	Day 1 – Sorbtech EXP-2, 6 lb/MMacf Day 2 – DARCO E-13, 6 lb/MMacf Day 3 – DARCO Hg, 2 and 4 lb/MMacf Day 4 – TBD, 2 and 4 lb/MMacf Day 5 – TBD, 2 and 4 lb/MMacf	Full Load 6AM-6PM
Break	4/10-4/14/06	Review Results from Parametric Tests Define Operating Conditions for Long-Term Tests	
Week 4: Parametric Optimization and Temp. Stratification	4/17/06	Day 1 – TBD, Hg removal 1 and 2[c] Day 2 – TBD, Hg removal level 3[c] Day 3-5 Sorbent and concentration TBD.	Full Load 6AM-6PM
Long-term tests	4/21/06	Operate at consistent injection rate 24 hours a day, 4 weeks, while load following. Conduct Manual Sampling tests during week 4. .	Full Load only during Ontario Hydro

[a] Manual Sampling includes: ASTM M6784-02 (mercury), STM (modified 40 CFR, pt. 75 app.K, mercury), EPA M5 or 17 (particulate), EPA M26a (halogens), Controlled Condensate (SO_3), EPA M29 (Multi-Metals)

[b] Close-Coupled Over-Fire Air for all tests

[c]Hg removal levels 1, 2 and 3 will be identified by the test team after reviewing "screening" results

During long-term testing, the Hg CEM at the outlet of the ESP will be monitoring flue gas exiting one duct. In an effort to better characterize the emissions from the Conesville Unit 6 ESP, STM tests will be conducted on the other three ducts. Two sampling consoles are available through the project. These will be configured for duplicate simultaneous sampling on one duct. These will be moved daily to collect emissions data across the unit. If AEP has additional sampling systems available to dedicate to the program, additional samples will be collected.

Task 4. Data Analysis

Data collection and analysis for this program is designed to measure the effect of sorbent injection on mercury control and the impact on the existing pollution control equipment. The mercury levels and plant operation will be characterized with and without sorbent injection and the long-term evaluation to identify effects that may not be immediate. A sample list of plant parameters is given below:

- Boiler Load
- Boiler Excess O_2
- Coal
  - Coal firing rate
  - Coal trainload data (e.g. short prox and ultimate analysis)
- Temperatures
  - Economizer Outlet Temperature
  - Air Preheater Outlet Temperature
  - ESP Outlet/Scrubber Inlet Temperature
  - Scrubber Outlet Temperature
- ESP Electrical Conditions
  - Secondary Current
  - Secondary Voltage
  - Secondary Power
  - Spark Rate
- Wet Scrubber Operation
  - Liquid/gas ratio
  - Fresh slurry feed rate and percent solids or surrogate (i.e. pump amps)
  - Recycle feed rate and percent solids
  - Operating pH
  - SO_2 inlet, if available, or scrubber efficiency
- CEM data
  - Opacity
  - CO
  - CO_2
  - SO_2
  - NOx
  - Stack Gas Flow
  - Stack Gas Temperature
- Ambient Temperature
- Ambient Barometric Pressure

Many signals typically archived by the plant will be monitored to determine if any correlation exists between changes in mercury concentration with measured plant operation. A correlation is not unusual between temperature and load, for example.

Task 5. Coal and Byproduct Evaluation

Coal and combustion byproduct samples collected throughout the field test will be analyzed in this task. During all test phases, samples of coal, fly ash, scrubber slurry, and other sample streams will be collected. Select samples will be chosen by the test team for analysis. Ultimate and proximate analyses will be performed along with mercury, and chlorine for the coal samples. The ash will be analyzed for mercury and other potential tests such as alkalinity, size distribution, chlorine, fluorine, and metals such as selenium and arsenic. Additional tests will be conducted to determine the environmental stability of the samples. These tests include TCLP, SGLP and thermal stability tests. Tests are also being discussed to determine the potential of microbial activity on mercury release. A sample of the analyses included is presented in Table 8.

Although previous tests from this program and others have shown that the byproducts mixed with activated carbon are highly stable, it is important to continue evaluating these byproducts for each condition using well-established and documented techniques, and new techniques designed to perform even more robust analyses of the byproducts. Additional ash will be collected and archived for other tests, including tests requested by EPA, DOE, and independent companies approved by DOE and AEP.

Standard leaching test methods will include the Toxicity Characteristic Leaching Procedure (TCLP, SW846-1311) and synthetic groundwater leaching procedure (SGLP). If a chemically treated sorbent is chosen for long-term tests, leaching of the chemical used in the treatment process will be reviewed.

The final series of tests are optional, based on whether a determination is made that additional analyses are needed for purposes of troubleshooting or for gaining additional insight into control options. For example, it may be desirable to determine the size and composition of the ash for certain applications. These analyses will provide information on the impacts of mercury control on ash properties. The properties have a significant impact on the performance of combustion and environmental control systems.

Sample and data management are needed for tracking a large quantity of samples from various process streams at AEP's Conesville Station. ADA-ES has developed a Sample and Data Management System (SDMS) that will store test data from the evaluation. These data can be used to generate reports, track sample history, and input results from laboratory analyses.

The SDMS will also store plant operational data and other test data during the evaluation. Pertinent plant operating parameters will be logged electronically and formatted into a common spreadsheet, which will be delivered to the test team daily. After all test data have gone through a QA/QC process, these data will be uploaded to the SDMS. It will provide links to previous project publications, schedules, and memos. The SDMS will have the capabilities to query certain data sets and generate plots and other necessary documents.

For data control and security, access to the sample database is limited to the ADA-ES project manager, site manager, and sample manager. Operators collecting samples will be able to upload information to the database and print sample labels and Chain-of-Custody forms. ADA-ES will include results with regularly issued reports to the test team.

Table 8. Summary of Byproduct and Waste Characterization Testing

Series	Test Purpose	Test Method	Comments
1	Ash Disposal	TCLP (SW846-1311)	Measures leachable Hg, As, Ba, Cd, Cr, Pb, Se, Ag
2	Environmental Stability – Leaching	SGLP	Measures leachable Hg at 18 hours, 2 weeks, and 4 weeks
3	Special Testing	Various	As needed for troubleshooting or site-specific information needs

Task 6. Design and Economics of Site-Specific Control System

After completion of testing and analysis of the data at each plant, the requirements and costs for full-scale permanent commercial implementation of the selected mercury control technology will be determined.

ADA-ES will meet with the host utility plant and engineering personnel to develop plant-specific design criteria. Process equipment will be sized and designed based on test results and the plant-specific requirements (reagent storage capacity, plant arrangement, retrofit issues, winterization, controls interface, etc.). A conceptual design document will be developed. Sorbent type and sources will be evaluated to determine the most cost-effective reagent(s) for the site.

Modifications to existing plant equipment will be determined and a work scope document will be developed based on input from the plant. This may include modifications to the particulate collector, ash handling system, compressed air supply, electric power capacity, other plant auxiliary equipment, utilities, and other balance of plant engineering requirements.

Finally, a budget cost estimate will be developed to implement the control technology. This will include capital cost estimates for mercury control process equipment as well as projected annual operating costs. Where possible, order-of-magnitude estimates will be included for plant modifications and balance of plant items.

Task 7. Prepare Site Report

A site report will be prepared documenting measurements, test procedures, analyses, and results obtained in Task 2. This report is intended to be a stand-alone document providing a comprehensive review of the testing that will be submitted to the host utility.

Schedule

The tentative schedule for activities at Conesville is shown in Figure 7.

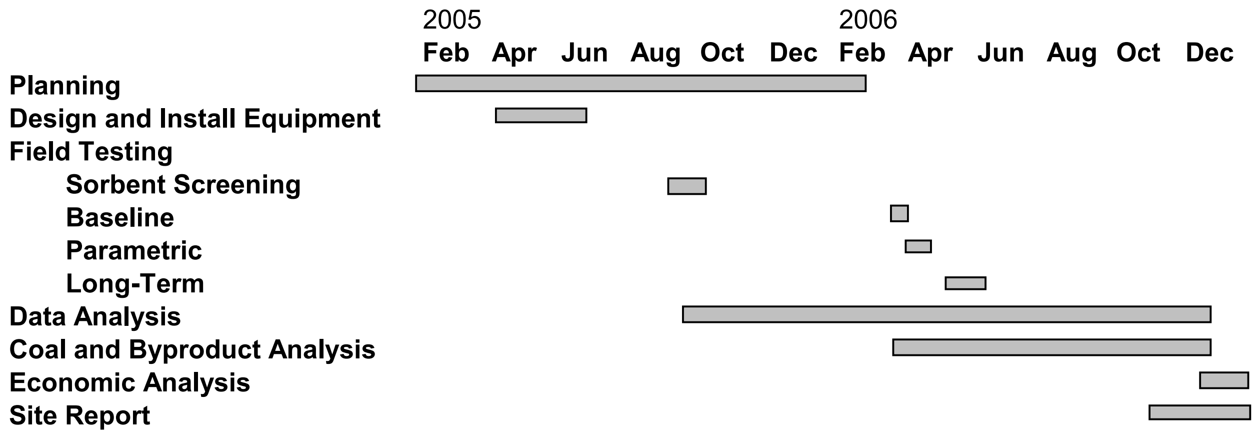


Figure 7. Tentative Schedule for Conesville in 2006

Key Personnel

Key personnel for the Conesville tests are identified in Table 9.

Table 9. Key Project Personnel for Conesville Mercury Field Evaluation

Name	Company	Role	Phone #	E-MAIL/Cell Phone
Aimee Toole	AEP Columbus	Project Manager	614-716-1570	artoole@aep.com 614-309-9582
Gary Spitznogle	AEP Columbus	Project Manager	614-716-1570	gospitznogle@aep.com 614-716-3671
Georgeanne Hammond	AEP Conesville	Environmental Coordinator	740-829-4065	gmhammond@aep.com
Paul Medaugh	AEP Conesville	Site Engineer	740-829-4060	pamedaugh@aep.com
Sharon Sjostrom	ADA-ES	Program Manager	303-339-8856	sharons@adaes.com 303-919-8538
Cody Wilson	ADA-ES	Site Manager	303-339-8860	codyw@adaes.com 303-358-0825
Jerry Amrhein	ADA-ES	Hg CEM	303-339-8841	jerrya@adaes.com 303-921-8138
Richard Schlager	ADA-ES	Contracts	303-339-8855	Richards@adaes.com
Connie Senior	Reaction Engineering	Tech Expert: Coal and Byproducts, Flow Modeling	801-364-6925 ext 37	senior@reaction-eng.com
Michael Durham	ADA-ES	Technical Expert	303-734-1727	miked@adaes.com
Jean Bustard	ADA-ES	Technical Expert	303-734-1727	jeanb@adaes.com
Andrew O'Palko	DOE/NETL	DOE/NETL Project Manager	304 285-4715	andrew.opalko@netl.doe.gov
Ramsay Chang	EPRI	EPRI Project Manager	650-855-2535	Rchang@epri.com

APPENDIX B: Conesville Sample and Data Management Plan

LABORATORY MERCURY FIELD EVALUATION

Evaluation of Sorbent Injection for Mercury Control at AEP's Conesville Power Plant

Sample and Data Management Plan

Prepared by:

ADA Environmental Solutions, Inc.
8100 SouthPark Way, Unit B
Littleton, CO 80120

February 6, 2006

ADA-ES, Inc. is conducting an evaluation of sorbent injection for mercury control at AEP's Conesville Power Plant. The overall objective of this project is to determine the cost and effects of sorbent injection for control of mercury in stack emissions.

During the evaluation, fuel samples and certain process byproducts will be collected for determinations of mercury content, stability, and other analytes. Process byproducts of interest include but are not limited to:

- Bottom Ash
- ESP Fly Ash
- Scrubber Byproducts

Sample and data management are needed for tracking approximately 400 samples from various liquid and solid process streams at the Conesville Power Plant. ADA-ES has developed a Sample and Data Management System (SDMS) that will store test data from the evaluation. These data can be used to generate reports, track sample history, and input results from laboratory analyses.

ADA-ES will also store plant operational data and other test data during the evaluation. Pertinent plant operating parameters will be logged electronically. ADA-ES will include results with regularly issued reports to the test team.

Sampling Locations

Samples of various gaseous, liquid, and solid process streams will be collected during the evaluation. Specific flue gas samples are not included in this document. Sampling locations for Conesville Power Plant Unit 6 are shown in Figure 1.

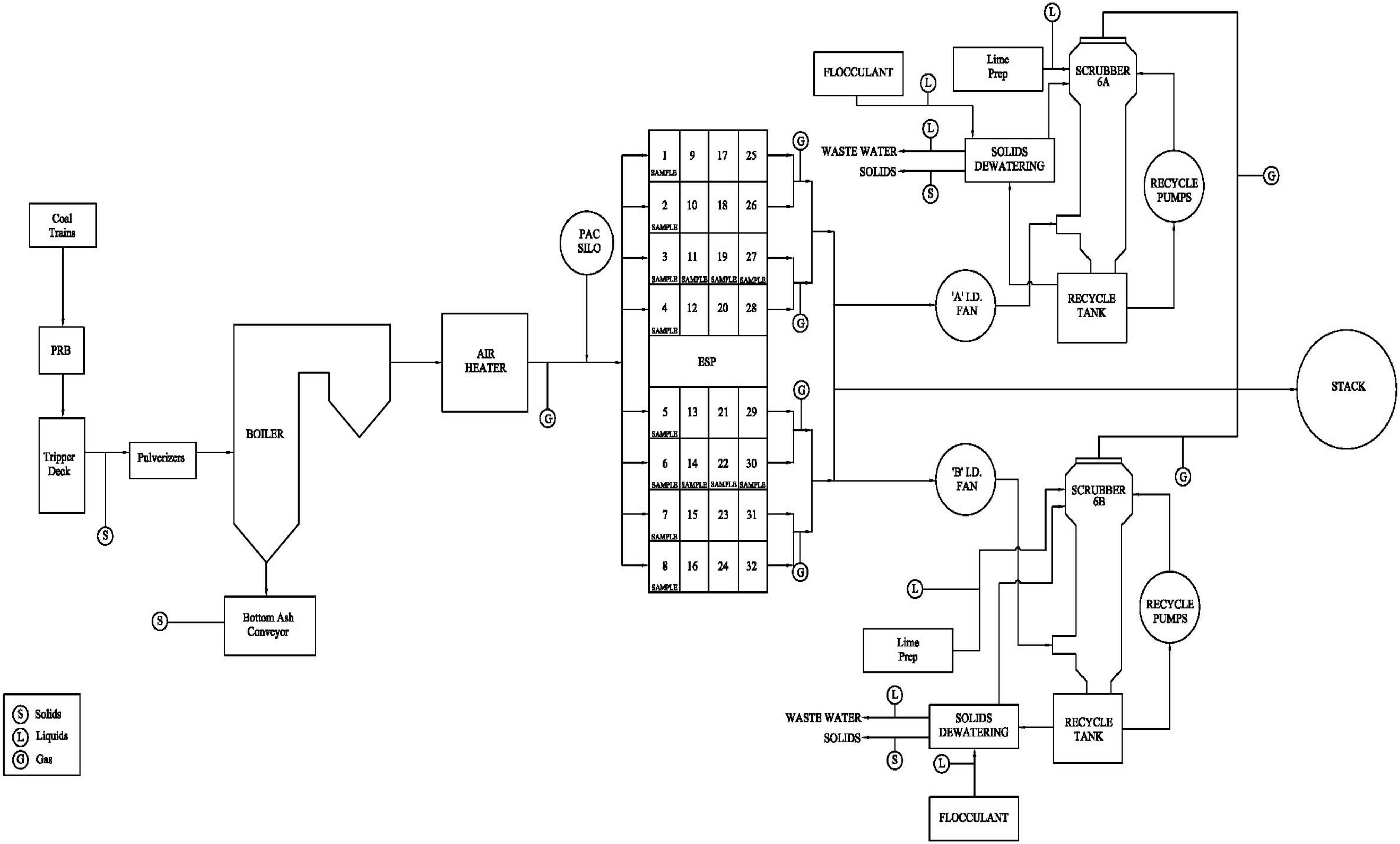


Figure 1. Conesville Power Plant Unit 6 Configuration and Sampling Locations.

Sample Collection

Coal and combustion byproducts will be collected during the mercury control evaluation. Samples will be segregated by the test condition (baseline, each parametric test, and long-term test). Collecting a representative sample is the primary objective of the sampling strategy. Representative samples will be collected only under stable and normal operating conditions unless otherwise directed by ADA-ES personnel.

Sample Streams

Coal Samples – Daily as-received samples will be provided to ADA-ES. If the caol delivery schedule is such that coal is being loaded from the coal pile, the belt loading the bunkers will be stopped to collect a sample across the belt. This will ensure the coal sample collected is representative of the coal being fired during the test period.

Bottom Ash – Bottom ash samples should be collected prior to being mixed with any other process streams. Bottom ash samples will be collected two times a week during baseline and long-term testing from the bottom ash conveyor. Collection locations shall be specified by Conesville Station personnel.

ESP Fly Ash – Grab samples of ash will be collected from the ESP hoppers each day of testing. Samples will be segregated by the test condition (baseline, each parametric test, and long-term test). The samples will be stored in 1-liter or 5-gallon sample containers for shipping to the analytical laboratories. The schedule indicates sampling from multiple rows on both the control side and test side of the ESP. These samples will be used to determine if stratification exists throughout the system and to compare ash properties of the test side with the control side.

Ash samples should be collected at approximately 1:00pm every weekday to ensure the sample collected is representative of the ash during the test period. A sketch showing the hoppers from the ESP is shown in Figure 2. The shaded hoppers indicate the hoppers from which fly ash samples will be collected.

Ash Silo – Ash samples will also periodically be collected from the Unit 6 ash silo to determine the properties of the ash collected in the ESP as a whole.

Scrubber Samples – Grab samples of the lime and flocculent feed streams to the scrubber, and solid and liquid byproduct streams from the scrubber will be collected during the baseline and long-term test periods. The samples will be used to identify the effects of sorbent injection on scrubber byproducts and allow a mercury balance to be conducted.

Gas Flow **Gas Flow**

32	31	30	29	28	27	26	25
24	23	22	21	20	19	18	17
16	15	14	13	12	11	10	9
8	7	6	5	4	3	2	1

East ESP **West ESP**

*Sampled Hopper

Figure 2. ESP Hopper Layout and Sampling Locations.

Table 1. Tentative Sampling Schedule.

Test Condition	Type	Frequency	Volume Collected
Baseline and Long Term	Coal	Daily	1 liter
	ESP Ash	Daily: One Hopper Each Field, Middle Row (e.g.4,12,20,28)	1 liter
		2 samples per week Four Inlet hoppers (26,28,30,32)	1 liter
		2 sample per week during source testing: Four Inlet hoppers (26,28,30,32) Four Row 2 hoppers (18,20,22,24) Two Row 3 hoppers (10,12,14,16) Two Row 4 hoppers (2,4,6,8)	3 liters*
		Weekly: One Inlet Hopper (28) Ash Silo	**5 gallon – Sample, each**
	Scrubber Samples	2 samples per week: Lime Feed, Flocculant Feed, Solid Byproducts, Liquid Byproducts	1 liter, each
Parametric	Coal	Daily	1 liter
	ESP Ash	Daily: One Hopper Each Row, One Inlet Hopper on each side (4,12,20,28,30)	1 liter
		High Inj. Conc per sorbent: Four Inlet hoppers (26,28,30,32) Ash Silo	3 liter, each*

*2 liters to AEP for characterization, 1 to program (ADA-ES)

Sample Management Strategy

During the mercury control evaluation, Conesville plant personnel, as directed by ADA-ES, will collect the liquid and solid samples. ADA-ES will deliver a sampling schedule, which shows the sampling frequency, volume, and specific samples to collect during each testing day. A sample management flow chart is shown in Figure 3.

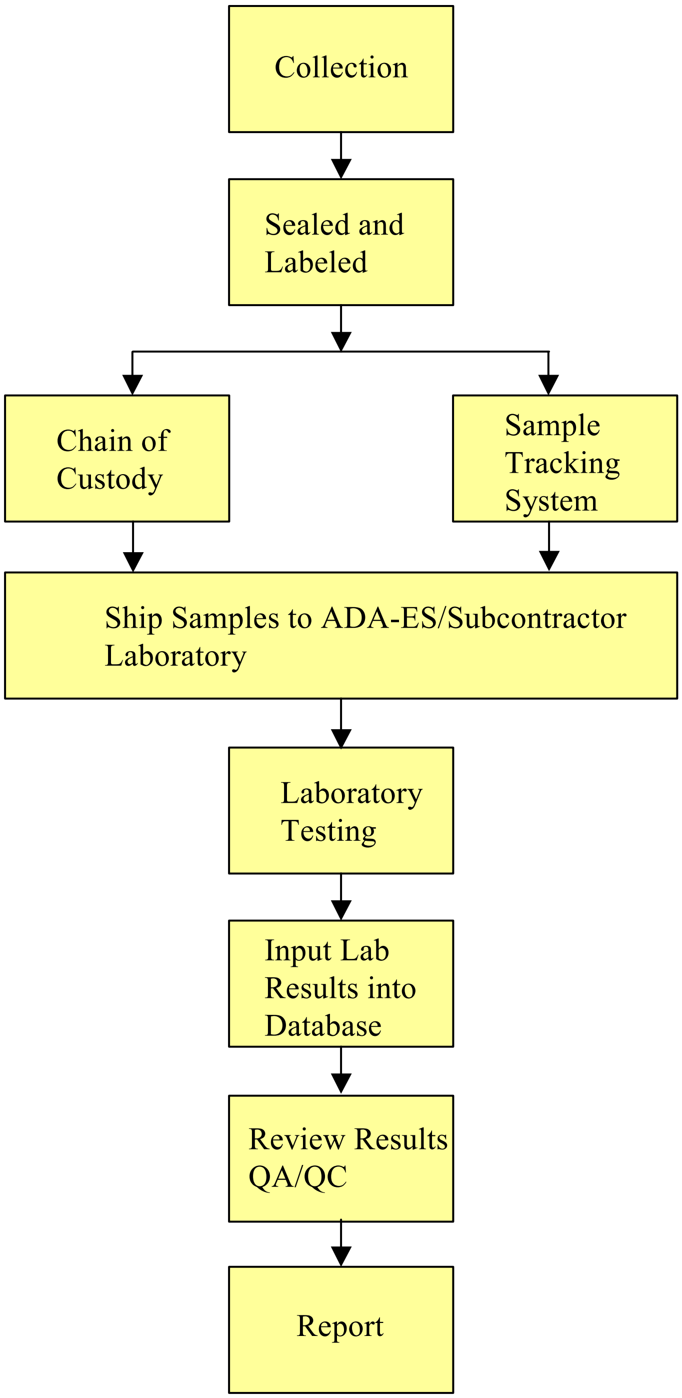


Figure 3. Sample Management Flowchart.

Once the samples have been collected, they will be delivered to ADA-ES personnel to be sealed and labeled. The samples will be logged into a database and given a sample identification number. Authorized project team members will have access to the database to see which samples have been collected and are available for testing.

Once the samples have been sealed and labeled, ADA-ES personnel will generate a Chain-of Custody (COC) form to be delivered with each shipment of samples. The COC will be used for sample tracking and identification. Although ADA-ES will not enforce the strict COC procedures (e.g., signatures to release sample custody, controlled access), all pertinent information will be recorded.

Several samples, along with a COC, will be shipped directly from the plant to AEP's Dolan laboratory for analysis. Examples include coal samples collected for ultimate and proximate analysis.

Sample Analysis

Although previous tests from this program and others have shown that the byproducts mixed with activated carbon are highly stable, it is important to continue evaluating these byproducts for each condition using well-established and documented techniques, and new techniques designed to perform even more robust analyses of the byproducts. Additional ash samples will be collected and archived for other tests, including tests requested by EPA, DOE, and independent companies approved by DOE. No samples will be shipped to outside firms without prior approval of AEP and DOE.

Standard leaching test methods conducted on the fly ash samples will include the Toxicity Characteristic Leaching Procedure (TCLP, SW846-1311) and the synthetic groundwater leaching procedure (SGLP). Solid and liquid samples will be collected and analyzed according to the methods as prescribed in Table 2. If a chemically treated sorbent is chosen for long-term tests, leaching of the chemical used in the treatment process will be reviewed.

The final series of tests are optional, based on whether a determination is made that additional analyses are needed for purposes of troubleshooting or for gaining additional insight into control options. For example, it may be desirable to determine the size and composition of the ash for certain applications. These analyses will provide information on the impacts of mercury control on ash and scrubber byproduct properties. The properties have a significant impact on the performance of combustion and environmental control systems.

Table 2. Summary of Byproduct and Waste Characterization Testing

Series	Test Purpose	Test Method	Comments
1	Ash Disposal	TCLP (SW846-1311)	Measures leachable Hg, As, Ba, Cd, Cr, Pb, Se, Ag
3	Environmental Stability – Leaching	EERC SGLP	Measures leachable Hg at 18 hours, 2 weeks, and 4 weeks
4	Special Testing	Various	As needed for troubleshooting or site-specific information needs

Once the laboratory testing is complete, results will be logged into the SDMS. Authorized project team members will have access to the database to view the results. A report will be generated summarizing results from the sample analyses.

Flue Gas Samples

Flue gas measurements will be made at the locations indicated on Figure 1. Flue gas analyses include Ontario Hydros, Method 17, Method 26a, and Controlled Condensate. Hg analyzers will also be used at selected locations measuring near-real-time vapor-phase mercury concentrations in the flue gas.

Table 3. Sampling and Analytical Matrix.

Sampling Location	Sample/Type	Sampling Method	Analytical Method
ESP Inlet	Speciated Mercury	Ontario Hydro	EPA SW 846 7470 cold vapor atomic absorption spectrometry (CVAAS)
	HBr, HCl, HF, BR_2, CL_2	M26a	Ion chromatography per the promulgated EPA Method 26a
	Particulate Matter	M17	Gravimetrically
	Hg	M324	EPA Method 1631
	Total/Elemental Mercury	Continuous	Hg CEM
	SO_3	Controlled Condensate	Per Method
ESP Outlet	Speciated Mercury	Ontario Hydro	EPA SW 846 7470 cold vapor atomic absorption spectrometry (CVAAS)
	HBr, HCl, HF, BR_2, CL_2	M26a	Ion chromatography per the promulgated EPA Method 26a
	Particulate Matter	M17	Gravimetrically
	Hg	M324	EPA Method 1631
	Total/Elemental Mercury	Continuous	Hg CEM
Coal Fuel to Boiler	Hg	Grab Sample	ASTM D6414-99 or 01
	Cl	Grab Sample	Modified ASTM D5808 (Oxidative Hydrolysis Microcoulometry)
	Br, F	Grab Sample	Neutron Activation Analysis
	Ultimate Analysis	Grab Sample	
	Proximate Analysis	Grab Sample	
	Trace Metals	Grab Sample	
Bottom Ash, Fly Ash, Scrubber Byproducts	Hg	Grab Sample	ASTM D6414-99 or 01
	Cl	Grab Sample	Modified ASTM D5808 (Oxidative Hydrolysis Microcoulometry)
	LOI / Carbon Content	Grab Sample	
	Leaching	Grab Sample	TCLP, SW846-1311, SGLP
	Trace Metals, Elements	Grab Sample	

APPENDIX C: Vapor-Phase Mercury Emissions Using Sorbent Trap Method (STM)

Vapor-Phase Mercury Emissions Using Sorbent Trap Method (STM)

This non-isokinetic test method samples flue gas, while minimizing particulate capture, and provides total vapor-phase mercury emissions. The dry sorbent trap method was proposed in the Utility Mercury Reduction Rule (FR January 30, 2004) as a draft EPA test method, *Method 324 Determination of Vapor Phase Flue Gas Mercury Emissions from Stationary Sources Using Dry Sorbent Trap Sampling.* Within the Rule, the method was proposed either for application as a reference method test, or for continuous compliance measurement for mercury. ADA-ES has used the method in the field since the early 1990's, and conducted the validation testing for Method 324, in which it compared favorably with the Ontario Hydro Method. The procedures used during the tests conducted at Conesville are consistent with the procedures used during validation testing of the new Method.

In the Clean Air Mercury Rule (CAMR) signed by the EPA Administrator on March 15, 2005, the proposed Method 324 was revised and renamed as 40 CFR Part 75 Appendix K. The revised and renamed method will be an option for some sources for continuous compliance measurements for mercury. The method described in Appendix K has many rigorous quality control requirements that are in excess of what is necessary for the Big Brown tests. However, the principles of the method described in 40 CFR Part 75 Appendix K will be applied in this test program and will be referred to as the sorbent trap method (STM). The detailed procedures to be followed are summarized here.

This mercury measurement method extracts a known volume of flue gas from a duct through a dry sorbent trap (containing a specially treated form of activated carbon) as a single-point sample, with a nominal flow rate of about 400 cc/min at the gas meter. The dry sorbent trap, which is in the flue gas stream during testing, represents the entire mercury sample. Each trap is recovered in the field and shipped to a specialized lab such as Frontier GeoSciences, Inc. for analysis. Each trap is acid leached and the resulting leachate is analyzed for mercury using cold vapor atomic fluorescence spectrometry. Samples can be collected over time periods ranging from less than an hour to weeks in duration. The test result provides a time averaged total vapor-phase mercury measurement of the flue gas stream.

STM sampling collects paired samples as a quality control measure. The analysis results of the paired sample trains are compared and are typically in agreement within 5-20% relative percent difference (RPD) or about 1 lb/TBtu. Another built-in quality assurance measure is achieved through the analysis of two trap sections in series. Each trap has two separate mercury sorbent sections, as shown in Figure C-1, and the "B" section is analyzed to evaluate whether any mercury breakthrough occurred. Low B section mercury, in conjunction with a field blank trap, is used to confirm overall sample handling quality.

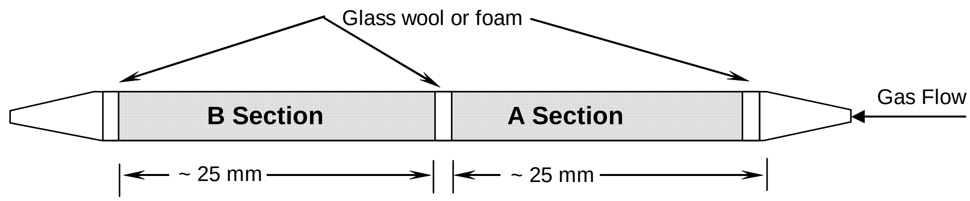


Figure C-1. Two mercury sorbent trap sections in series.

The sample train is fairly simple, as shown in Figure C-2. Major components are a dry sorbent trap mounted directly on the end of a probe (usually heated), a moisture knockout outside the duct, and a sampling console that controls the sampling rate and meters the flue gas, as well as recording data in a data logger. Key temperatures, sampling volume, and barometric pressure are recorded on field sampling data sheets and/or by a data logger for each sample run.

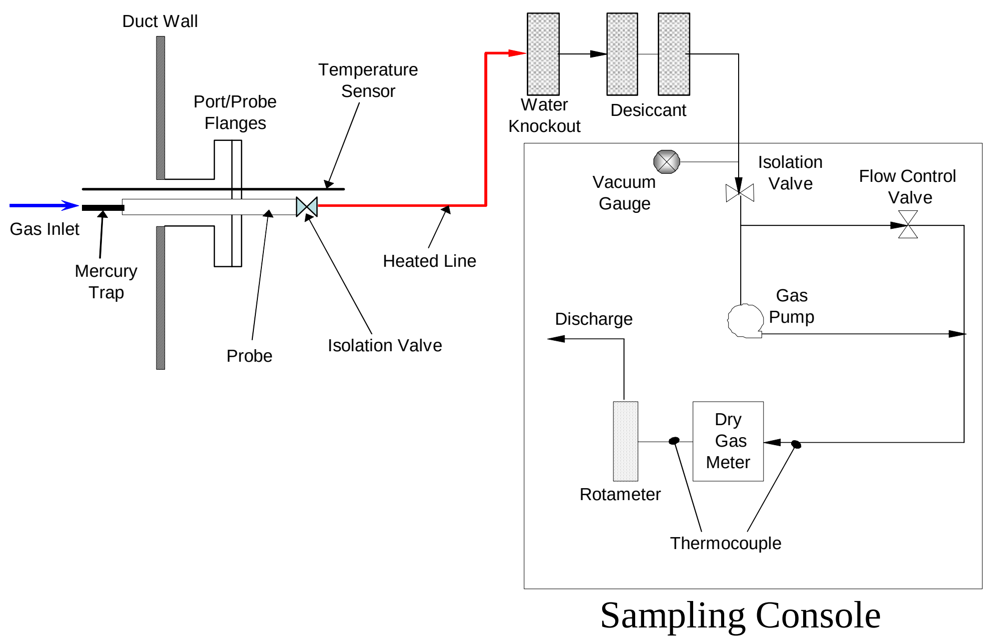


Figure C-2. Sample Trainercury concentration in units of µg/dNm^3. Using stack gas flow rate and gaseous data from the plant's CEMS and coal Ultimate Analysis (or EPA Method 19 F-Factors, if Ultimate Analysis is unavailable), results can be calculated and reported in lb/TBtu.

APPENDIX D: Carbon Injection and Delivery System

Carbon Injection and Delivery System

Figure D-1 is a photograph of a 20 ton capacity sorbent silo identical to the one installed at Conesville. Powdered activated carbon (PAC) is delivered by bulk pneumatic trucks and loaded into the silo, which is equipped with a bin vent bag filter. From the discharge section of the silo, the sorbent is metered by variable speed screw feeders into eductors that provide the motive force to carry the sorbent through flexible hose to distribution manifolds located on the flue gas ducts at the ESP inlet, feeding the injection lances. Regenerative blowers provided the conveying air. A programmable logic controller (PLC) system is used to control system operation and adjust injection rates. The unit is approximately 50 feet high and 10 feet in diameter with an empty weight of 10 tons.

Figure D-1. Carbon Injection Storage Silo and Feeder Trains

APPENDIX E: Mercury CEMs

Mercury CEMs

Two mercury CEMs, Thermo Electron *Mercury Freedom System*™, were placed at the inlet and outlet of the ESP to characterize typical mercury concentrations, speciation, and native mercury behavior. The performance of these systems was verified using Ontario Hydro (OH) measurements and Sorbent Trap Method measurements.

Three key components of the CEM are the sample extraction probe/converter, the mercury analyzer, and the calibration module. These are described briefly below and presented in Figure E-1, which is a schematic of the entire system, showing the key components and other supporting instrumentation.

- **Sample Extraction Probe/Converter**. An inertial filter is used to separate a particulate-free vapor-phase sample while minimizing the interactions with fly ash, which can cause sampling artifacts. The sample is immediately diluted with pre-heated dilution air to minimize mercury reactions with other flue gas species.
- **Mercury Analyzer**. Mercury is measured directly in the analyzer using Cold Vapor Atomic Fluorescence Spectroscopy (CVAFS). There is no cross interference from SO_2 with CVAFS. Because the sample is diluted, it has low moisture, is relatively non-reactive, and therefore has minimal interference from other gases.
- **Calibration Module**. The calibrator module incorporates a mercury source in a temperature-controlled chamber that can be heated or cooled to maintain the source at a precise temperature. The operator can program the calibrator to deliver zero or span gas to the analyzer, to the sample port between the inertial filter and the critical orifice, or upstream of the inertial filter.

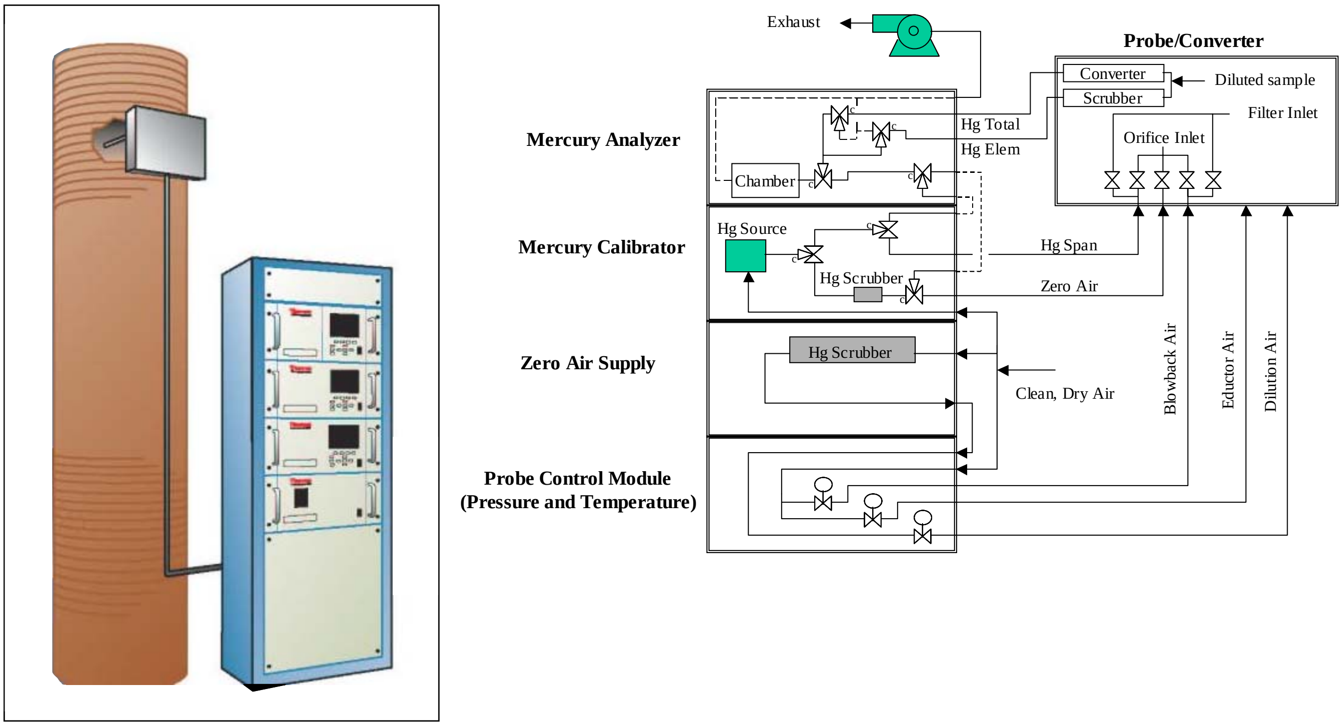


Figure E-1. Thermo Electron Mercury Freedom System™

APPENDIX F: Sorbent Screening Devices

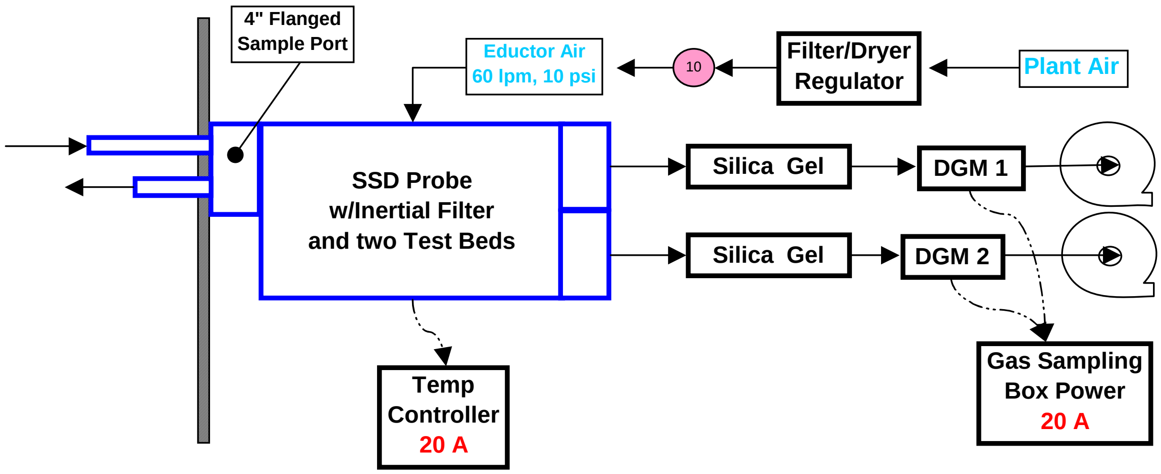
Sorbent Screening Devices

Two sorbent screening devices (SSD) were used at Conesville during sorbent screening. These devices were designed to operate similarly, both employing a fixed-bed of sorbent mixed with ash from the Conesville Unit 6 ESP and inert quartz sand. One device is extractive and uses sorbent traps to measure the mercury downstream of the sorbent bed. These sorbent screening tests were conducted at a port located downstream of the Unit 6 ESP as indicated in Figure F-1. The other device is an attachment to the Thermo CEM extraction probe and the Thermo CEM is used to measure the downstream mercury. Both devices are described in detail below.

Figure F-1. ESP Outlet Location for Sorbent Screening

F.1 Extractive Device

The extractive SSD test apparatus consists of a temperature controlled NEMA (National Electrical Manufacturers Association) container connected to an extraction probe box and a stack sampling console with two Dry Gas Meters (DGM) to measure volume. The NEMA box mounts directly to a 4-inch, flanged sample port and contains an inertial filter to separate fly ash in the flue gas from the sample stream, a gas eductor, and two sorbent test beds with downstream carbon traps. A sketch of the major components of the system and associated plant requirements is shown in Figure F-2. Figure F-3 shows the internal components of the NEMA box, including two upgrades added to the system following the first round of testing at Conesville to assure adequate temperature control. The system upgrades were a heater on the inlet probe to prevent SO_3 condensation in the inlet line and a venturi to monitor the flow in the inlet line. The section of the NEMA box containing the inertial filter is maintained at 400°F. Figure F-4 shows the test bed and sorbent trap holders along with the heated enclosure that holds sample trains.



Plant Requirements

1. 4" Flanged Sample Port
2. 2 x 20 Amp, 120V Power Lines
3. Plant Air (60 lpm, 10 psi)

Figure F-2. Extractive SSD Components

A typical test consisted of installing the test beds, leak-checking, heating to 325°F, and then drawing flue gas through the assembly for 90 minutes. Upon subsequent analyses, the mercury collected in the test beds and carbon traps were used to determine the mercury removal efficiency of the sorbent. For these tests, the inlet mercury concentration was calculated as the sum of the mercury in the test bed and carbon trap. The mercury removed by the sorbent is the amount of mercury in the sorbent bed divided by the inlet mercury.

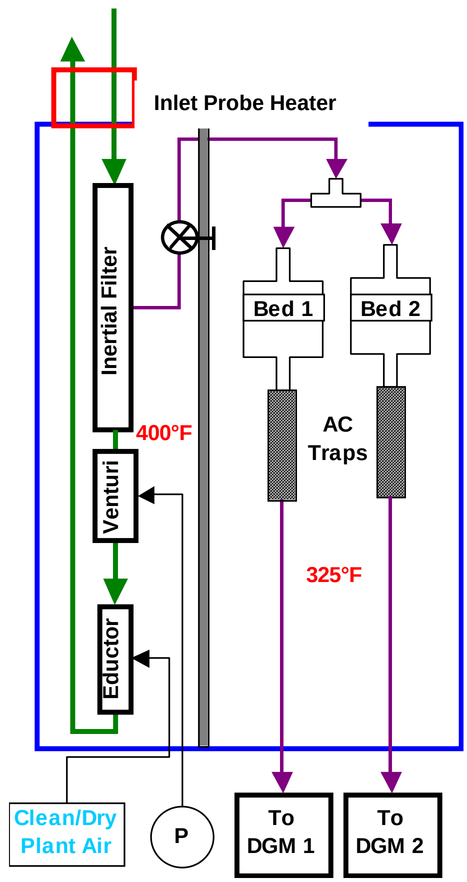


Figure F-3. Sketch of SSD Enclosure

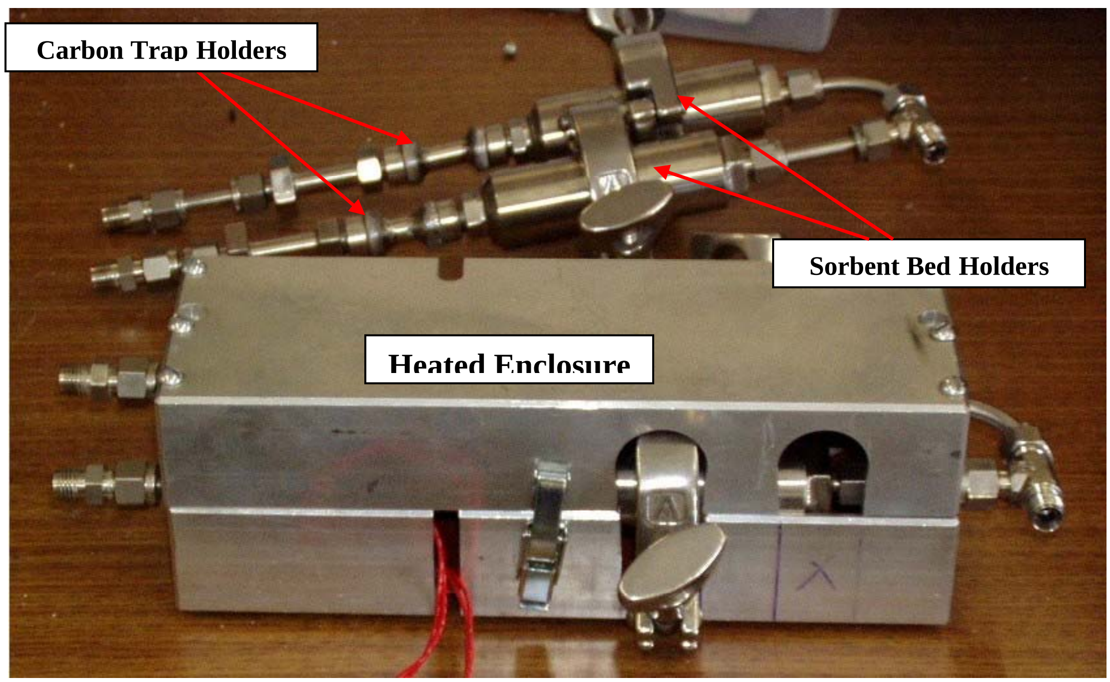


Figure F-4. Sample Train Holder and Heater

F.2 In-Situ Device

Prior to the third round of SSD testing at Conesville, a sorbent bed was installed on a stainless steel bed-holder at the tip of the Thermo Mercury CEM probe. A sketch of this bed is presented in Figure F-5. The ½-inch tube shown on the left of the figure attaches directly to the probe stinger using compression fittings. This device offers two distinct advantages over the extractive device: 1) the bed is installed in the duct, minimizing concerns over SO_3 deposition in cold spots, and 2) mercury is monitored using the CEM, which provides a record of the breakthrough behavior of the sorbents.

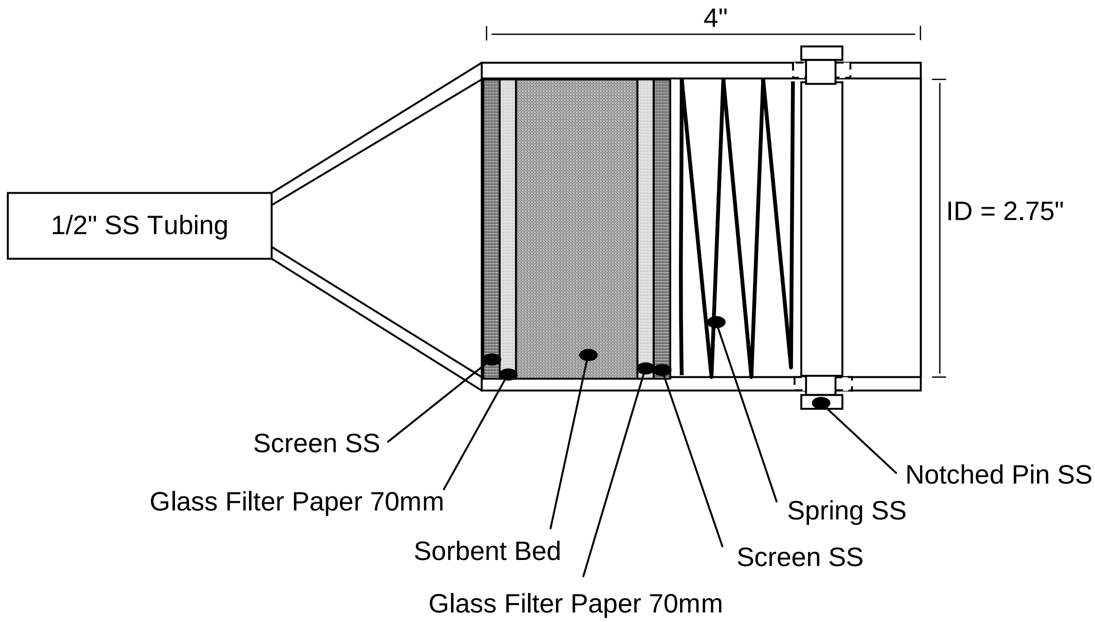


Figure F-5. Probe-tip Sorbent Screening Bed

APPENDIX G: Source Testing Report

HALOGENS, SPECIATED MERCURY, TRACE METALS, SULFURIC ACID MIST AND PARTICULATE BASELINE STUDY

Performed for

ADA-ES, Inc.

At the

American Electric Power Company
Conesville Power Plant
Unit 6
Conesville, Ohio

Test Dates

March 14 through 17, 2006

Platt Environmental Services, Inc. Report PE2006043

Report Submittal Date

September 25, 2006

TABLE OF CONTENTS

CERTIFICATION SHEET

Having reviewed the test program described in this report, I hereby certify the data, information, and results in this report to be accurate and true according to the methods and procedures used.

Data collected under the supervision of others is included in this report and is presumed to have been gathered in accordance with recognized standards.

PLATT ENVIRONMENTAL SERVICES, INC.

E. L. Ehlers

Eric Ehlers
Senior Project Manager

1.0 INTRODUCTION

Platt Environmental Services, Inc., ("Platt Environmental") performed a baseline speciated mercury, halogens, metals and particulate emission test program on the Unit 6 ESP Inlet and Outlet at the Conesville Power Plant of American Electric Power Company (AEP) in Conesville, Ohio on March 14 through 17, 2006. Speciated mercury was also measured at the Unit 6 FGD Outlet. The tests were authorized by AEP and performed for ADA-ES, Inc. The halogens that were measured are: hydrogen chloride (HCl), hygrogen fluoride (HF), bromine (Br_2), hydrogen bromide (HBr), and chlorine (Cl_2).

The purpose of this test program was to establish baseline emissions for the above parameters during normal operating conditions. The halogens measured were: hydrogen chloride (HCl), hygrogen fluoride (HF), bromine (Br_2), hydrogen bromide (HBr), and chlorine (Cl_2).

1.1 Project Contact Information

Location	Address	Contact
Test Coordinator	ADA-ES, Inc. 8100 South Park Way Unit B Littleton, Colorado, 80120	Mr. Cody Wilson Project Engineer 303-734-1727 (phone) 303-734-0330 (fax) codyw@adaes.com
Testing Company Representative	Platt Environmental Services, Inc. 371 Balm Court Wood Dale, Illinois 60191	Eric Ehlers Senior Project Manager 630-521-9400 (phone) 630-521-9494 (fax) eehlers@plattenv.com

The tests were conducted by Messrs. J. Halla, C. Trezak, A. Smith, Z. Linden and E. Ehlers of Platt Environmental.

2.0 SUMMARY OF RESULTS

The following table summarizes test results at each of the test locations:

Parameter	Reference Method	Unit 6 ESP Inlet	Unit 6 ESP Outlet	Unit 6 FGD Outlet
Particle Bound Mercury (ug/dncm)	Ontario Hydro	1.49	0.003	0.005
Oxidized Mercury (ug/dncm)	Ontario Hydro	20.00	23.62	1.82
Elemental Mercury (ug/dncm)	Ontario Hydro	5.42	7.46	13.59
Total Mercury (ug/dncm)	Ontario Hydro	26.91	31.08	15.42
Mercury (ug/dncm)	Method 29	19.94	20.97	N/A
Arsenic (ug/dncm)	Method 29	145.83	32.40	N/A
Selenium (ug/dncm)	Method 29	325.28	122.30	N/A
HCl (ppm)	Method 26A	45.98	54.10	N/A
HF (ppm)	Method 26A	1.71	2.37	N/A
HBr (ppm)	Method 26A	0.45	0.32	N/A
Br_2 (ppm)	Method 26A	0.11	0.07	N/A
Cl_2 (ppm)	Method 26A	10.38	10.29	N/A
Particulate (mg/dncm)	Method 5/17	5589.47	13.41	N/A
H_2SO_4 (ppm)	Method 8A	2.61	12.06	N/A

Complete test results for all test locations and parameters are appended in Section 6.0.

3.0 DISCUSSION OF RESULTS

Source operation appeared normal during the entire test program. Test number one of the Ontario Hydro test series at both the ESP Inlet and ESP Outlet failed their respective post test leak checks, and were not analyzed. An additional Ontario Hyro test run was performed at each location. The sample probe internal heat tape at the ESP Inlet was destroyed during test two of the Halogen test series and a portion of the liner was captured in the sample. This sample was also rerun at both the inlet and outlet locations. Test number three at the FGD Outlet was not included in the test average due to an apparent leak in the sample train.

4.0 TEST PROCEDURES

All testing, sampling, analytical, and calibration procedures used for this test program were performed as described in the Title 40, Code of Federal Regulations, Part 60 (40CFR60), Appendix A, Methods 1, 2, 3, 5, 17, 26A, 29, NCASI Method 8A, and the Ontario Hydro Method.

4.1 Volumetric Flowrate Determination

In order to determine the emission rate on a lbs/hr basis, the gas velocities and volumetric flowrates were determined using Method 2, 40CFR60.

Velocity pressures were determined by traversing the test locations with S-type pitot tubes. Temperatures were measured using K-type thermocouples with calibrated digital temperature indicators. The molecular weight and moisture content of the gases were determined to permit the calculation of the volumetric flowrate. Sampling points utilized were determined using Method 1, 40CFR60.

4.2 Oxygen (O_2)/Carbon Dioxide (CO_2) Determination

Oxygen (O_2) and carbon dioxide (CO_2) gas contents were determined in accordance with Method 3, 40CFR60. This method collected samples in a grab manner and analyzed the samples using a Burrell gas analyzer. Several gas extractions were performed during each test run to ensure a stable reading. Mandatory leak checks were performed prior to and following each use. Chemicals are changed frequently and inspected for reactivity prior to each use.

4.3 Sulfur Trioxide (SO_3) Determination

The National Council of the Paper Industry for Air and Stream Improvement Inc. (NCASI) Method 8A, Determination of Sulfuric Acid Vapor or Mist and Sulfur Dioxide Emissions from Kraft Recovery Furnaces. NCASI Method 8A, test procedure was used to determine the sulfur trioxide (SO_3) concentrations and sulfuric acid (H_2SO_4) mist as H_2SO_4 at the Unit 6 ESP Inlet and Outlet test locations.

By using a modified Graham condenser, the gas is collected to the acid dew point at which the SO_3 (H_2SO_4 vapor) condenses. The temperature of the gas is kept above the water dew point to prevent an interference from SO_2 while a heated quartz filter system removes particulate matter.

After each run, the probe, connecting lines, controlled condensation coil, and filter holder, were cleaned. The probe and connecting lines were rinsed with demineralized water. The filter holder was inspected and cleaned before the next run and the filter pad was replaced.

Prior to use, the controlled condensation coil (CCC) was cleaned and dried. The CCC was transported to the site with a stopper in each end. The CCC was connected to a water bath and the circulation of the (167°F - 185°F) water was started. This evaporates any premature condensation.

With the probe still out of the stack, the train was assembled. All ball joints were checked to ensure they were completely clean and free of dust. Because of the possibility that the grease will seize at the temperatures employed, grease was not used.

A leak check was performed on the complete system. If the leak rate is less than 0.003 cfm, the system was ready for use. If a leak rate greater than 0.003 cfm was found, the system was checked for loose joints and connections. Any leak was corrected prior to the start of the test. A post test leak check followed each test.

The probe and the filter holder were heated to greater than 350°F and 500°F, respectively. The heating bath is set at between (167°F - 185°F). Once the temperatures reached these values, the run commenced.

After leak checking, the pump was again turned on and the flowrate adjusted to 8 lpm (0.3 cfm) using the dry test meter and a stopwatch. The pump was turned off without readjusting the valve settings.

At the end of the sampling period, the probe was removed from the duct, a leak check performed and the pump slowly shut off. After the pressure dropped, the CCC was removed from the system without removing the water bath hoses. The CCC was carefully connected to the Erlenmeyer flask without spilling any condensate in the tube. In 10 ml increments (up to 30 mls), demineralized water was used to rinse out the CCC. The rinse solution in the stoppered Erlenmeyer was transferred to the laboratory and was diluted to with 100% IPA to reach a 80% IPA matrix prior to analysis.

The probe was rinsed with 30 mls of demineralized water. This solution was transferred to the laboratory and filtered through a Whatman No. 1 filter into a 50 ml volumetric flask.

The filter and any debris from the filter holder was removed and placed into the probe wash bottle.

The method of analysis was titration. All samples were carefully handled, stored in clean glassware and the coil rinse was analyzed as soon as possible. All results were recorded on the appended laboratory data sheet.

4.4 Speciated Mercury Determination

One (1) test point was sampled using one (1) port at the Unit 6 ESP Inlet and Outlet test locations and 16 points using 8 test ports at the FGD Outlet test location.

The speciated mercury sample train was manufactured by Environmental Supply Company of Durham, North Carolina and meets all specifications required by The Ontario Hydro Method. A glass-lined probe was used at the Unit 6 ESP Outlet and FGD Outlet locations while a Teflon lined probe was used at the Inlet location. Drawings depicting the sampling ports, test point locations, and sample trains are appended to this report. Velocity pressures were determined simultaneously during sampling with a calibrated S-type pitot tube and inclined manometer. All temperatures were measured using K-type thermocouples with calibrated digital temperature indicators.

The outlet filter media were quartz filters exhibiting a ≥99.97% efficiency on 0.3 micron DOP smoke particles in accordance with ASTM Standard Method D-2986-71. The inlet test employed a quartz-thimble prefilter. All sample contact surfaces of the train were washed with 0.1 N Nitric Acid. These washes were placed in sealed and marked containers for analysis. All sample recovery of impinger solutions was performed on site.

4.5 Halogen Determination

Hydrogen chloride (HCl), hydrogen fluoride (HF), hydrogen bromide (HBr), Bromine (Br_2) and chlorine (Cl_2) concentrations were determined using Method 26A, 40CFR60. An integrated sample was extracted isokinetically from each gas stream and passed through dilute (0.1 N) sulfuric acid. In the dilute acid, the HCl dissolved and formed chloride (Cl) ions. The chloride ions were then analyzed by impingers. The first and second impingers contained the dilute sulfuric acid, the third and fourth impingers contained a 0.1 N sodium hydroxide (NaOH) scrubber solution to remove any remaining chlorine, and the fifth impinger contained silica gel to absorb any remaining moisture. Each train was leak checked prior to and after each run. The samples were recovered quantatively transferring the contents of the impingers and deionized water rinses to sample jars. The samples were mixed and labeled, and the level marked for transfer to the laboratory. In the dilute acid, HCl, HBr and HF are dissolved and free ions which are then analyzed by ion chromatography.

4.6 Trace Metals Determination

The Method 29 trace metals sample train is one of the comprehensive sampling systems used to sample stack gas effluent. This system is based upon the design of units which are normally employed for sampling under Method 5, 40CFR60. The modified system consisted of a probe, a high-efficiency glass fiber filter stage, and four impingers.

The train consisted of the following components: a glass liner wrapped with heating wire and a stainless steel jacket. Samples were collected while the probe was heated to a gas temperature of 248°F ± 25°F. The filter holder was equipped with a Teflon® filter support and a tared glass fiber filter. The filter medium was a Pall Corporation type A/E glass microfibre filters exhibiting a ≥ 99.98% efficiency on 0.3 micron DOP smoke particles. The filter holder was contained in an electrically heated enclosed box that was thermostatically maintained at a temperature of 248°F ± 25°F, which is sufficient to prevent water condensation in this portion of the train.

The first and second impingers were modified versions of the Greenburg-Smith design; initially, they were filled with 200 mls of 5% HNO_3/10% H_2O_2. The third impinger was also a Greenburg-Smith impinger. It was filled with 100 mls of acidic $KMnO_4$. The fourth impinger was filled with silica gel to absorb any remaining moisture.

All sample contact surfaces of the train were washed with 0.1 N nitric acid. The first two impingers were also washed with 0.1N nitric acid. The washes were placed in sealed and marked containers for analysis.

Copies of all sample analysis sheets are appended to this report.

Calculations were performed on a computer and by hand. An explanation of the nomenclature and calculations along with the complete test results are appended. Also appended are the calibration data and copies of the raw field data sheets.

Raw data are kept on file at the Platt Environmental office in Wood Dale, Illinois. All samples from this test program (not already used in analysis) will be retained for 60 days after the submittal of the report, after which they will be discarded unless Platt Environmental is advised otherwise.

5.0 QUALITY ASSURANCE PROCEDURES

Platt Environmental recognizes the previously described reference methods to be very technique oriented and attempts to minimize all factors which can increase error by implementing its Quality Assurance Program into every segment of its testing activities.

Shelf life of chemical reagents prepared at the Platt Environmental laboratory or at the jobsite did not exceed those specified in the above mentioned methods; and, those reagents having a shelf life of one week were prepared daily at the jobsite. When on-site analyses were required, all reagent standardizations were performed daily by the same person performing the analysis.

Dry and wet test meters were calibrated according to methods described in the Quality Assurance Handbook, Sections 3.3.2, 3.4.2 and 3.5.2. Percent error for the wet test meter according to the methods was less than the allowable error of 1.0 percent. The dry test meters measured the test sample volumes to within 2 percent at the flowrate and conditions encountered during sampling.

6.0 TEST RESULTS SUMMARY

SPECIATED MERCURY TEST RESULTS SUMMARY

Company: ADA
Plant: AEP Conesville
Unit: Unit 6 ESP Inlet

Test Run Number	2	3	4	5	Average
Source Condition	Normal	Normal	Normal	Normal	
Date	3/16/2006	3/16/2006	3/17/2006	3/17/2006	
Start Time	8:55	11:30	8:05	11:25	
End Time	11:00	13:35	10:10	12:54	
Particle Bound Mercury Emissions					
ppb	0.012	0.008	0.132	0.515	0.167
ug/dncm	0.11	0.07	1.18	4.61	1.49
ug/dncm at 3% O_2	0.15	0.10	1.66	6.47	2.10
lb/hr	0.00039	0.00026	0.00437	0.01715	0.00554
tons/yr	0.001712	0.001146	0.019158	0.075110	0.024282
lb/mmBtu	0.0000001	0.0000001	0.0000009	0.0000037	0.0000012
lb/Tbtu	0.08659	0.05753	0.94230	3.68236	1.19219
Elemental Mercury Emissions					
ppb	0.594	0.571	0.467	0.788	0.605
ug/dncm	5.32	5.12	4.18	7.06	5.42
ug/dncm at 3% O_2	7.47	7.18	5.87	9.90	7.60
lb/hr	0.01917	0.01858	0.01549	0.08153	0.03369
tons/yr	0.083978	0.081386	0.067863	0.357080	0.147577
lb/mmBtu	0.0000042	0.0000041	0.0000041	0.0000056	0.0000045
lb/Tbtu	4.24791	4.08446	4.08446	5.63421	4.51276
Oxidized Mercury Emissions					
ppb	1.191	1.321	3.968	2.449	2.233
ug/dncm	10.67	11.83	35.54	21.94	20.00
ug/dncm at 3% O_2	14.97	16.60	49.85	30.77	28.05
lb/hr	0.03843	0.04296	0.13165	0.08153	0.07364
tons/yr	0.168337	0.188180	0.576643	0.357080	0.322560
lb/mmBtu	0.0000085	0.0000094	0.0000284	0.0000175	0.0000160
lb/Tbtu	8.51507	9.44412	28.36262	17.50630	15.95703
Total Mercury Emissions					
ppb	1.798	1.901	4.567	3.753	3.005
ug/dncm	16.10	17.02	40.90	33.61	26.91
ug/dncm at 3% O_2	22.59	23.88	57.38	47.15	37.75
lb/hr	0.05800	0.06181	0.15152	0.12491	0.09906
tons/yr	0.254027	0.270712	0.663664	0.547112	0.433879
lb/mmBtu	0.0000128	0.0000136	0.0000326	0.0000268	0.0000215
lb/Tbtu	12.84958	13.58612	32.64279	26.82288	21.47534
Stack Parameters:					
Average Gas Temperature, °F	333.3	332.9	332.9	334.0	333.3
Average Gas Velocity, ft/sec	38.497	38.680	38.888	39.001	38.766
Flue Gas Moisture, percent by volume	7.5	7.2	6.6	6.5	7.0
Average Flue Pressure, in. Hg	28.12	28.12	28.35	28.35	
Barometric Pressure, in. Hg	29.00	29.00	29.23	29.23	
Average %CO_2 by volume, dry basis	13.0	13.0	13.0	13.0	13.0
Average %O_2 by volume, dry basis	6.0	6.0	6.0	6.0	6.0
Dry Molecular Wt. of Gas, lb/lb-mole	30.320	30.320	30.320	30.320	
Gas Sample Volume, dscf	62.866	63.087	64.512	45.090	
Isokinetic Variance	100.1	99.7	99.9	99.4	

SPECIATED MERCURY TEST RESULTS SUMMARY

Company: ADA
Plant: AEP Conesville
Unit: Unit 6 ESP Outlet

Test Run Number	**2**	**3**	**4**	**Average**
Source Condition	Normal	Normal	Normal	
Date	3/16/2006	3/16/2006	3/17/2006	
Start Time	8:55	11:30	8:05	
End Time	10:55	13:30	10:05	
Particle Bound Mercury Emissions				
ppb	0.0003	0.0003	0.0004	0.0004
ug/dncm	0.003	0.003	0.004	0.003
ug/dncm at 3% O_2	0.004	0.004	0.006	0.005
lb/hr	0.00001	0.00001	0.00001	0.00001
tons/yr	0.000037	0.000037	0.000052	0.000042
lb/mmBtu	0.0000000	0.0000000	0.0000000	0.0000000
lb/Tbtu	0.00254	0.00254	0.00334	0.00281
Elemental Mercury Emissions				
ppb	0.504128	0.587420	1.406565	0.833
ug/dncm	4.52	5.26	12.60	7.46
ug/dncm at 3% O_2	6.79	7.91	18.94	11.21
lb/hr	0.01296	0.01487	0.03794	0.02192
tons/yr	0.056767	0.065117	0.166171	0.096018
lb/mmBtu	0.0000039	0.0000045	0.0000108	0.0000064
lb/Tbtu	3.86246	4.50062	10.77664	6.37990
Oxidized Mercury Emissions				
ppb	1.233786	1.823256	4.854737	2.637
ug/dncm	11.05	16.33	43.48	23.62
ug/dncm at 3% O_2	16.62	24.55	65.38	35.52
lb/hr	0.03172	0.04614	0.13094	0.06960
tons/yr	0.138931	0.202111	0.573538	0.304860
lb/mmBtu	0.0000095	0.0000140	0.0000372	0.0000202
lb/Tbtu	9.45286	13.96918	37.19539	20.20581
Total Mercury Emissions				
ppb	1.738246	2.411008	6.261739	3.470
ug/dncm	15.57	21.59	56.08	31.08
ug/dncm at 3% O_2	23.41	32.47	84.33	46.73
lb/hr	0.04469	0.06102	0.16890	0.09153
tons/yr	0.195735	0.267264	0.739761	0.400920
lb/mmBtu	0.0000133	0.0000185	0.0000480	0.0000266
lb/Tbtu	13.31786	18.47234	47.97536	26.58852
Stack Parameters:				
Average Gas Temperature, °F	337.0	339.3	330.9	335.8
Average Gas Velocity, ft/sec	38.673	38.498	40.682	39.284
Flue Gas Moisture, percent by volume	5.7	6.5	7.1	6.4
Average Flue Pressure, in. Hg	28.29	28.29	28.42	
Barometric Pressure, in. Hg	29.10	29.10	29.23	
Average %CO_2 by volume, dry basis	12.0	12.0	12.0	12.0
Average %O_2 by volume, dry basis	7.0	7.0	7.0	7.0
Dry Molecular Wt. of Gas, lb/lb-mole	30.200	30.200	30.200	
Gas Sample Volume, dscf	63.790	63.821	67.897	
Isokinetic Variance	96.9	98.5	98.3	

SPECIATED MERCURY TEST RESULTS SUMMARY

Company: ADA
Plant: AEP Conesville
Unit: Unit 6 FGD Outlet

Test Run Number	**1**	**2**	**3***	**Average**
Source Condition	Normal	Normal	Normal	
Date	3/17/2006	3/17/2006	3/17/2006	
Start Time	11:25	13:20	15:25	
End Time	12:58	15:02	16:59	
Particle Bound Mercury Emissions				
ppb	0.0006	0.0006	0.0006	0.0006
ug/dncm	0.005	0.005	0.005	0.005
ug/dncm at 3% O_2	0.008	0.008	0.008	0.008
lb/hr	0.00004	0.00004	0.00004	0.00004
tons/yr	0.000186	0.000182	0.000189	0.000184
lb/mmBtu	0.0000000	0.0000000	0.0000000	0.0000000
lb/Tbtu	0.00435	0.00430	0.00435	0.00433
Elemental Mercury Emissions				
ppb	1.520	1.516	0.804	1.5176
ug/dncm	13.61	13.57	7.20	13.59
ug/dncm at 3% O_2	20.46	20.41	10.83	20.44
lb/hr	0.11375	0.11191	0.06123	0.11283
tons/yr	0.498223	0.490145	0.268208	0.494184
lb/mmBtu	0.0000116	0.0000116	0.0000116	0.0000116
lb/Tbtu	11.64250	11.61240	11.61240	11.62745
Oxidized Mercury Emissions				
ppb	0.301	0.106	0.087	0.2034
ug/dncm	2.70	0.95	0.78	1.82
ug/dncm at 3% O_2	4.06	1.42	1.18	2.74
lb/hr	0.02255	0.00779	0.00665	0.01517
tons/yr	0.098750	0.034129	0.029128	0.066439
lb/mmBtu	0.0000023	0.0000008	0.0000007	0.0000016
lb/Tbtu	2.30760	0.80857	0.66934	1.55808
Total Mercury Emissions				
ppb	1.821	1.622	0.892	1.7215
ug/dncm	16.31	14.53	7.99	15.42
ug/dncm at 3% O_2	24.53	21.84	12.02	23.18
lb/hr	0.13634	0.11974	0.06793	0.12804
tons/yr	0.597160	0.524456	0.297525	0.560808
lb/mmBtu	0.0000140	0.0000124	0.0000068	0.0000132
lb/Tbtu	13.95445	12.42527	6.83688	13.18986
Stack Parameters:				
Average Gas Temperature, °F	125.3	123.0	122.9	123.8
Average Gas Velocity, ft/sec	98.540	97.871	96.070	97.494
Flue Gas Moisture, percent by volume	11.8	12.8*	8.4	11.0
Average Flue Pressure, in. Hg	29.30	29.30	29.30	
Barometric Pressure, in. Hg	29.23	29.23	29.23	
Average %CO_2 by volume, dry basis	12.0	12.0	12.0	12.0
Average %O_2 by volume, dry basis	7.0	7.0	7.0	7.0
Dry Molecular Wt. of Gas, lb/lb-mole	30.200	30.200	30.200	
Gas Sample Volume, dscf	37.230	37.689	37.295	
Isokinetic Variance	101.7	104.4	100.2	

* Test 3 not included in average due to apparent leakage in the sampling train.

HALOGEN TEST RESULTS SUMMARY

Company: ADA
Plant: AEP Conesville
Unit: Unit 6 ESP Inlet

Test Run Number	1	3	4	Average
Source Condition	Normal	Normal	Normal	
Date	3/14/2006	3/14/2006	3/14/2006	
Start Time	10:00	14:25	16:20	
End Time	11:08	15:30	17:25	
HCl Emissions:				
ppm:	14.66	61.29	61.99	45.98
ug/dncm	23865.24	99781.45	100922.19	74856.29
lb/hr	89.4189	364.5572	366.5915	273.5226
tons/yr	391.6548	1596.7608	1605.6709	1198.0288
lb/mmBtu	0.01904	0.07963	0.08054	0.05974
HF Emissions:				
ppm:	0.88	2.30	1.94	1.71
ug/dncm	787.13	2055.33	1733.79	1525.42
lb/hr	2.9493	7.5093	6.2979	5.5855
tons/yr	12.9177	32.8905	27.5846	24.4643
lb/mmBtu	0.00063	0.00164	6.29785	2.10004
HBr Emissions:				
ppm:	0.27	0.53	0.55	0.45
ug/dncm	971.36	1918.87	1983.94	1624.72
lb/hr	3.6395	7.0107	7.2065	5.9522
tons/yr	15.9410	30.7069	31.5645	26.0708
lb/mmBtu	0.00078	0.00153	0.00158	0.00130
Stack Parameters:				
Gas Volumetric Flow Rate, acfm	1,806,379	1,793,056	1,781,342	1,761,279
Gas Volumetric Flow Rate, dscfm	1,073,487	1,046,764	1,040,708	1,034,503
Average Gas Temperature, °F	329.6	331.2	333.3	330.6
Average Gas Velocity, ft/sec	38.992	38.704	38.451	38.018
Flue Gas Moisture, percent by volume	5.1	7.1	6.8	6.4
Average Flue Pressure, in. Hg	28.02	28.16	28.16	
Barometric Pressure, in. Hg	28.90	28.90	28.90	
Average %CO_2 by volume, dry basis	13.0	13.0	13.0	13.0
Average %O_2 by volume, dry basis	6.0	6.0	6.0	6.0
Dry Molecular Wt. of Gas, lb/lb-mole	30.320	30.320	30.320	
Gas Sample Volume, dscf	45.258	44.438	43.936	
Isokinetic Variance	98.4	99.1	98.6	

HALOGEN TEST RESULTS SUMMARY

Company: ADA
Plant: AEP Conesville
Unit: Unit 6 ESP Inlet

Test Run Number	**1**	**3**	**4**	**Average**
Source Condition	Normal	Normal	Normal	
Date	3/14/2006	3/14/2006	3/14/2006	
Start Time	10:00	14:25	16:20	
End Time	11:08	15:30	17:25	
Cl_2 Emissions:				
ppm:	30.95	0.03	0.16	10.38
ug/dncm	97973.08	85.28	491.67	32850.01
lb/hr	367.0881	0.3116	1.7860	123.0619
tons/yr	1607.8461	1.3648	7.8225	539.0111
lb/mmBtu	0.07818	0.00007	0.00039	0.02622
Br_2 Emissions:				
ppm:	0.28	0.02	0.02	0.11
ug/dncm	2009.70	170.57	172.52	784.26
lb/hr	7.5300	0.6232	0.6267	2.9266
tons/yr	32.9815	2.7295	2.7447	12.8186
lb/mmBtu	0.00160	0.00014	0.00014	0.00063
Stack Parameters:				
Gas Volumetric Flow Rate, acfm	1,806,379	1,793,056	1,781,342	1,761,279
Gas Volumetric Flow Rate, dscfm	1,073,487	1,046,764	1,040,708	1,034,503
Average Gas Temperature, °F	329.6	331.2	333.3	330.6
Average Gas Velocity, ft/sec	38.992	38.704	38.451	38.018
Flue Gas Moisture, percent by volume	5.1	7.1	6.8	6.4
Average Flue Pressure, in. Hg	28.02	28.16	28.16	
Barometric Pressure, in. Hg	28.90	28.90	28.90	
Average $\%CO_2$ by volume, dry basis	13.0	13.0	13.0	13.0
Average $\%O_2$ by volume, dry basis	6.0	6.0	6.0	6.0
Dry Molecular Wt. of Gas, lb/lb-mole	30.320	30.320	30.320	
Gas Sample Volume, dscf	45.258	44.438	43.936	
Isokinetic Variance	98.4	99.1	98.6	

HALOGEN TEST RESULTS SUMMARY

Company: ADA
Plant: AEP Conesville
Unit: Unit 6 ESP Outlet

Test Run Number	1	3	4	Average
Source Condition	Normal	Normal	Normal	
Date	3/14/2006	3/14/2006	3/14/2006	
Start Time	10:00	14:35	16:20	
End Time	11:17	15:39	17:25	
HCl Emissions:				
ppm:	11.98	90.57	59.76	54.10
ug/dncm	19495.71	147441.62	97296.29	88077.87
lb/hr	52.0078	390.7526	267.7832	236.8479
tons/yr	227.7942	1711.4963	1172.8905	1037.3937
lb/mmBtu	0.01668	0.12613	0.08323	0.07534
HF Emissions:				
ppm:	1.08	3.65	2.37	2.37
ug/dncm	966.08	3264.78	2115.14	2115.33
lb/hr	2.5772	8.6524	5.8214	5.6836
tons/yr	11.2880	37.8974	25.4976	24.8944
lb/mmBtu	0.00083	0.00279	5.82137	1.94166
HBr Emissions:				
ppm:	0.22	0.47	0.27	0.32
ug/dncm	800.72	1693.82	964.50	1153.01
lb/hr	2.1360	4.4890	2.6545	3.0932
tons/yr	9.3558	19.6618	11.6269	13.5482
lb/mmBtu	0.00068	0.00145	0.00083	0.00099
Stack Parameters:				
Gas Volumetric Flow Rate, acfm	1,281,445	1,285,028	1,319,479	1,295,168
Gas Volumetric Flow Rate, dscfm	764,298	759,302	788,533	767,919
Average Gas Temperature, °F	328.6	329.0	331.3	329.3
Average Gas Velocity, ft/sec	35.596	35.695	36.652	35.977
Flue Gas Moisture, percent by volume	5.4	6.2	4.9	5.8
Average Flue Pressure, in. Hg	28.16	28.16	28.16	
Barometric Pressure, in. Hg	28.90	28.90	28.90	
Average %CO_2 by volume, dry basis	12.0	12.0	12.0	12.1
Average %O_2 by volume, dry basis	7.0	7.0	7.0	6.9
Dry Molecular Wt. of Gas, lb/lb-mole	30.200	30.200	30.200	
Gas Sample Volume, dscf	43.544	43.182	44.794	
Isokinetic Variance	97.7	97.6	97.5	

HALOGEN TEST RESULTS SUMMARY

Company: ADA
Plant: AEP Conesville
Unit: Unit 6 ESP Outlet

Test Run Number	**1**	**3**	**4**	**Average**
Source Condition	Normal	Normal	Normal	
Date	3/14/2006	3/14/2006	3/14/2006	
Start Time	10:00	14:35	16:20	
End Time	11:17	15:39	17:25	
Cl_2 Emissions:				
ppm:	28.86	1.32	0.67	10.29
ug/dncm	91386.15	4186.29	2132.06	32568.17
lb/hr	243.7866	11.0946	5.8679	86.9164
tons/yr	1067.7853	48.5943	25.7016	380.6937
lb/mmBtu	0.07817	0.00358	0.00182	0.02786
Br_2 Emissions:				
ppm:	0.16	0.02	0.02	0.07
ug/dncm	1148.85	175.53	169.21	497.86
lb/hr	3.0647	0.4652	0.4657	1.3319
tons/yr	13.4236	2.0375	2.0398	5.8336
lb/mmBtu	0.00098	0.00015	0.00014	0.00043
Stack Parameters:				
Gas Volumetric Flow Rate, acfm	1,281,445	1,285,028	1,319,479	1,295,168
Gas Volumetric Flow Rate, dscfm	764,298	759,302	788,533	767,919
Average Gas Temperature, °F	328.6	329.0	331.3	329.3
Average Gas Velocity, ft/sec	35.596	35.695	36.652	35.977
Flue Gas Moisture, percent by volume	5.4	6.2	4.9	5.8
Average Flue Pressure, in. Hg	28.16	28.16	28.16	
Barometric Pressure, in. Hg	28.90	28.90	28.90	
Average %CO_2 by volume, dry basis	12.0	12.0	12.0	12.1
Average %O_2 by volume, dry basis	7.0	7.0	7.0	6.9
Dry Molecular Wt. of Gas, lb/lb-mole	30.200	30.200	30.200	
Gas Sample Volume, dscf	43.544	43.182	44.794	
Isokinetic Variance	97.7	97.6	97.5	

PARTICULATE TEST RESULTS SUMMARY

Company: ADA
Plant: AEP Conesville
Unit: Unit 6 ESP Inlet

Test Run Number	**1**	**3**	**4**	**Average**
Source Condition	Normal	Normal	Normal	
Date	3/14/2006	3/14/2006	3/14/2006	
Start Time	10:00	14:25	16:20	
End Time	11:08	15:30	17:25	
Filterable Particulate Emissions:				
gr/acf	1.4819	1.4905	1.0402	1.3375
gr/dscf	2.4935	2.5531	1.7805	2.2757
lb/hr	22943.895	22907.520	15882.266	20577.894
mg/dncm	6124.4901	6270.8807	4373.0360	5589.4689
lb/mmBtu	4.8867	5.0035	3.4892	4.4598
Stack Parameters:				
Gas Volumetric Flow Rate, acfm	1,806,379	1,793,056	1,781,342	1,793,593
Gas Volumetric Flow Rate, dscfm	1,073,487	1,046,764	1,040,708	1,053,653
Average Gas Temperature, °F	329.6	331.2	333.3	331.3
Average Gas Velocity, ft/sec	38.992	38.704	38.451	38.716
Flue Gas Moisture, percent by volume	5.1	7.1	6.8	6.3
Average Flue Pressure, in. Hg	28.02	28.16	28.16	
Barometric Pressure, in. Hg	28.90	28.90	28.90	
Average %CO_2 by volume, dry basis	13.0	13.0	13.0	13.0
Average %O_2 by volume, dry basis	6.0	6.0	6.0	6.0
Dry Molecular Wt. of Gas, lb/lb-mole	30.320	30.320	30.320	
Gas Sample Volume, dscf	45.258	44.438	43.936	
Isokinetic Variance	98.4	99.1	98.6	

PARTICULATE TEST RESULTS SUMMARY

Company: ADA
Plant: AEP Conesville
Unit: Unit 6 ESP Outlet

Test Run Number	**1**	**3**	**4**	**Average**
Source Condition	Normal	Normal	Normal	
Date	3/14/2006	3/14/2006	3/14/2006	
Start Time	10:00	14:35	16:20	
End Time	11:17	15:39	17:25	
Filterable Particulate Emissions:				
gr/acf	0.0025	0.0029	0.0044	0.0032
gr/dscf	0.0041	0.0048	0.0074	0.0055
lb/hr	26.928	31.395	50.289	36.204
mg/dncm	10.0960	11.8480	18.2748	13.4063
lb/mmBtu	0.0086	0.0101	0.0156	0.0115
Stack Parameters:				
Gas Volumetric Flow Rate, acfm	1,281,445	1,285,028	1,319,479	1,295,168
Gas Volumetric Flow Rate, dscfm	764,298	759,302	788,533	767,919
Average Gas Temperature, °F	328.6	329.0	331.3	329.3
Average Gas Velocity, ft/sec	35.596	35.695	36.652	35.977
Flue Gas Moisture, percent by volume	5.4	6.2	4.9	5.8
Average Flue Pressure, in. Hg	28.16	28.16	28.16	
Barometric Pressure, in. Hg	28.90	28.90	28.90	
Average %CO_2 by volume, dry basis	12.0	12.0	12.0	12.1
Average %O_2 by volume, dry basis	7.0	7.0	7.0	6.9
Dry Molecular Wt. of Gas, lb/lb-mole	30.200	30.200	30.200	
Gas Sample Volume, dscf	43.544	43.182	44.794	
Isokinetic Variance	97.7	97.6	97.5	

MERCURY, ARSENIC, AND SELENIUM TEST RESULTS SUMMARY

Company: ADA
Plant: AEP Conesville
Unit: ESP Inlet

Test Run Number	**1**	**2**	**3**	**Average**
Source Condition	Normal	Normal	Normal	
Date	3/15/2006	3/15/2006	3/15/2006	
Start Time	8:00	11:20	16:15	
End Time	9:35	12:55	17:50	
Mercury Emissions				
ppb:	2.492	2.004	2.184	2.227
ug/dncm	22.32	17.95	19.56	19.94
ug/dncm at 3% O_2	31.31	25.17	27.44	27.97
lb/hr	0.0800	0.0656	0.0706	0.0721
tons/yr	0.3506	0.2872	0.3092	0.3157
lb/mmBtu	0.00002	0.00001	0.00002	0.00002
lb/Tbtu	17.81203	14.32084	15.60991	15.91426
Arsenic Emissions				
ppb:	13.045	64.115	53.622	43.594
ug/dncm	43.64	214.48	179.38	145.83
ug/dncm at 3% O_2	61.21	300.85	251.61	204.56
lb/hr	0.1565	0.7837	0.6474	0.5292
tons/yr	0.6854	3.4324	2.8355	2.3178
lb/mmBtu	0.00003	0.00017	0.00014	0.00012
lb/Tbtu	34.82540	171.15818	143.14820	116.37726
Selenium Emissions				
ppb:	40.930	37.536	198.324	92.263
ug/dncm	144.30	132.34	699.22	325.28
ug/dncm at 3% O_2	202.41	185.63	980.78	456.27
lb/hr	0.5175	0.4835	2.5234	1.1748
tons/yr	2.2664	2.1179	11.0526	5.1457
lb/mmBtu	0.00012	0.00011	0.00056	0.00026
lb/Tbtu	115.15599	105.60824	557.98866	259.58430
Stack Parameters:				
Gas Volumetric Flow Rate, acfm	1,766,934	1,761,539	1,766,422	1,764,965
Gas Volumetric Flow Rate, dscfm	1,027,384	1,046,834	1,033,984	1,036,067
Average Gas Temperature, °F	332.6	333.1	332.3	332.6
Average Gas Velocity, ft/sec	38.140	38.024	38.129	38.098
Flue Gas Moisture, percent by volume	7.6	5.5	7.0	6.7
Average Flue Pressure, in. Hg	28.27	28.27	28.27	
Barometric Pressure, in. Hg	29.15	29.15	29.15	
Average %CO_2 by volume, dry basis	13.0	13.0	13.0	13.0
Average %O_2 by volume, dry basis	6.0	6.0	6.0	6.0
Dry Molecular Wt. of Gas, lb/lb-mole	30.320	30.320	30.320	
Gas Sample Volume, dscf	65.133	66.439	65.854	
Isokinetic Variance	98.7	98.8	99.1	

MERCURY, ARSENIC, AND SELENIUM TEST RESULTS SUMMARY

Company: ADA
Plant: AEP Conesville
Unit: ESP Outlet

Test Run Number	1	2	3	Average
Source Condition	Normal	Normal	Normal	
Date	3/15/2006	3/15/2006	3/15/2006	
Start Time	8:00	11:20	16:15	
End Time	9:30	12:50	17:45	
Mercury Emissions				
ppb:	2.949	1.975	2.098	2.341
ug/dncm	26.42	17.69	18.79	20.97
ug/dncm at 3% O_2	39.72	26.60	28.25	31.52
lb/hr	0.0681	0.0450	0.0491	0.0541
tons/yr	0.2984	0.1973	0.2152	0.2369
lb/mmBtu	0.00002	0.00002	0.00002	0.00002
lb/Tbtu	22.59740	15.13106	16.07481	17.93443
Arsenic Emissions				
ppb:	4.834	3.617	2.402	3.618
ug/dncm	43.30	32.39	21.52	32.40
ug/dncm at 3% O_2	65.10	48.71	32.35	48.72
lb/hr	0.1117	0.0825	0.0562	0.0835
tons/yr	0.4891	0.3612	0.2464	0.3656
lb/mmBtu	0.00004	0.00003	0.00002	0.00003
lb/Tbtu	37.03637	27.70978	18.40551	27.71722
Selenium Emissions				
ppb:	18.996	10.153	11.816	13.655
ug/dncm	170.13	90.94	105.83	122.30
ug/dncm at 3% O_2	255.81	136.73	159.12	183.89
lb/hr	0.4388	0.2315	0.2766	0.3157
tons/yr	1.9219	1.0141	1.2117	1.3826
lb/mmBtu	0.00015	0.00008	0.00009	0.00010
lb/Tbtu	145.53727	77.79076	90.52709	104.61837
Stack Parameters:				
Gas Volumetric Flow Rate, acfm	1,260,587	1,217,043	1,258,022	1,245,217
Gas Volumetric Flow Rate, dscfm	738,929	729,449	748,953	739,110
Average Gas Temperature, °F	328.7	328.8	330.8	329.4
Average Gas Velocity, ft/sec	35.016	33.807	34.945	34.589
Flue Gas Moisture, percent by volume	7.8	5.7	6.1	6.5
Average Flue Pressure, in. Hg	28.41	28.41	28.41	
Barometric Pressure, in. Hg	29.15	29.15	29.15	
Average %CO_2 by volume, dry basis	12.0	12.0	12.0	12.0
Average %O_2 by volume, dry basis	7.0	7.0	7.0	7.0
Dry Molecular Wt. of Gas, lb/lb-mole	30.200	30.200	30.200	
Gas Sample Volume, dscf	62.149	63.763	64.819	
Isokinetic Variance	96.2	100.0	99.0	

Sulfuric Acid Mist Test Results Summary

AEP Conesville - ADA-ES

Unit 6 ESP Inlet and Outlet

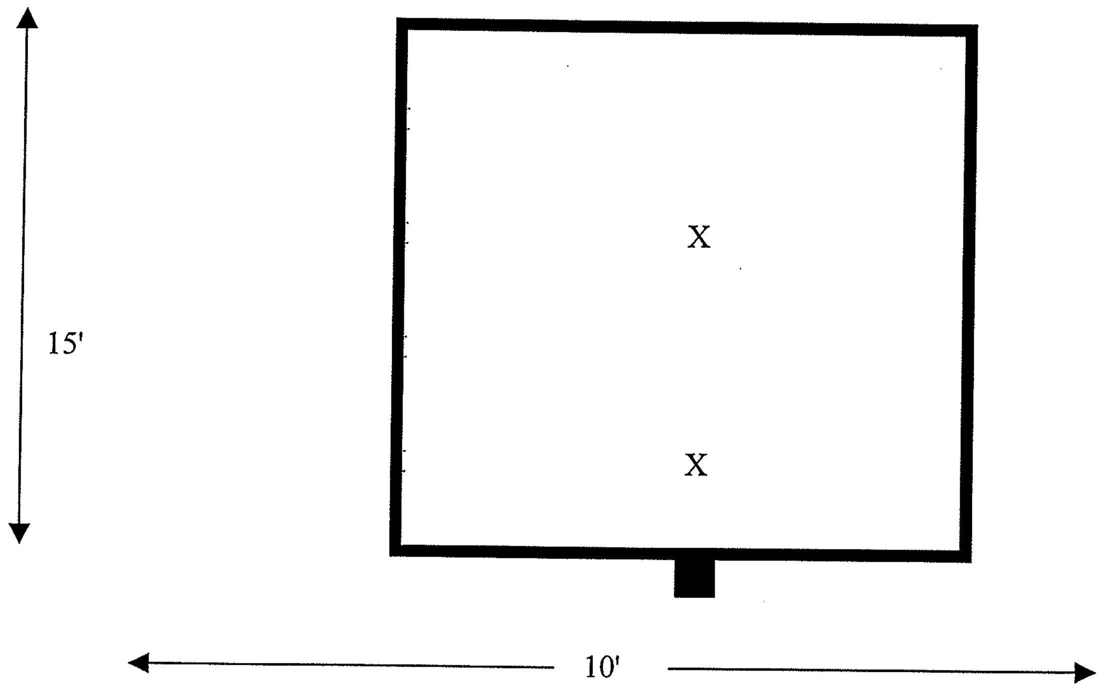
March 16, 2006

Test No.	Date	Time	V_m (L)	Molecular Weight	mg detected	ppm	lbs/hr*	DSCFM*
				ESP Inlet				
1	3/16/2005	15:00-16:00	566.01	98	7.3	3.16	49.976	1,034,503
2	3/16/2005	16:25-17:25	575.38	98	1.7	0.72	11.449	1,034,503
3	3/16/2005	17:45-18:45	577.24	98	9.3	3.95	62.430	1,034,503
		Average			6.1	2.61	41.285	1,034,503
				ESP Outlet				
1	3/16/2005	15:00-16:00	20.85	98	34.8	14.46	228.388	1,034,503
2	3/16/2005	16:25-17:25	20.63	98	26.5	11.13	175.794	1,034,503
3	3/16/2005	17:45-18:45	20.70	98	25.3	10.59	167.255	1,034,503
		Average			15.9	12.06	190.479	1,034,503

* Air flows taken from ESP Inlet data

APPENDIX

EQUAL AREA TRAVERSE FOR RECTANGULAR DUCTS



Job: AEP Conesville - ADA

Date: March 14 through 17, 2006

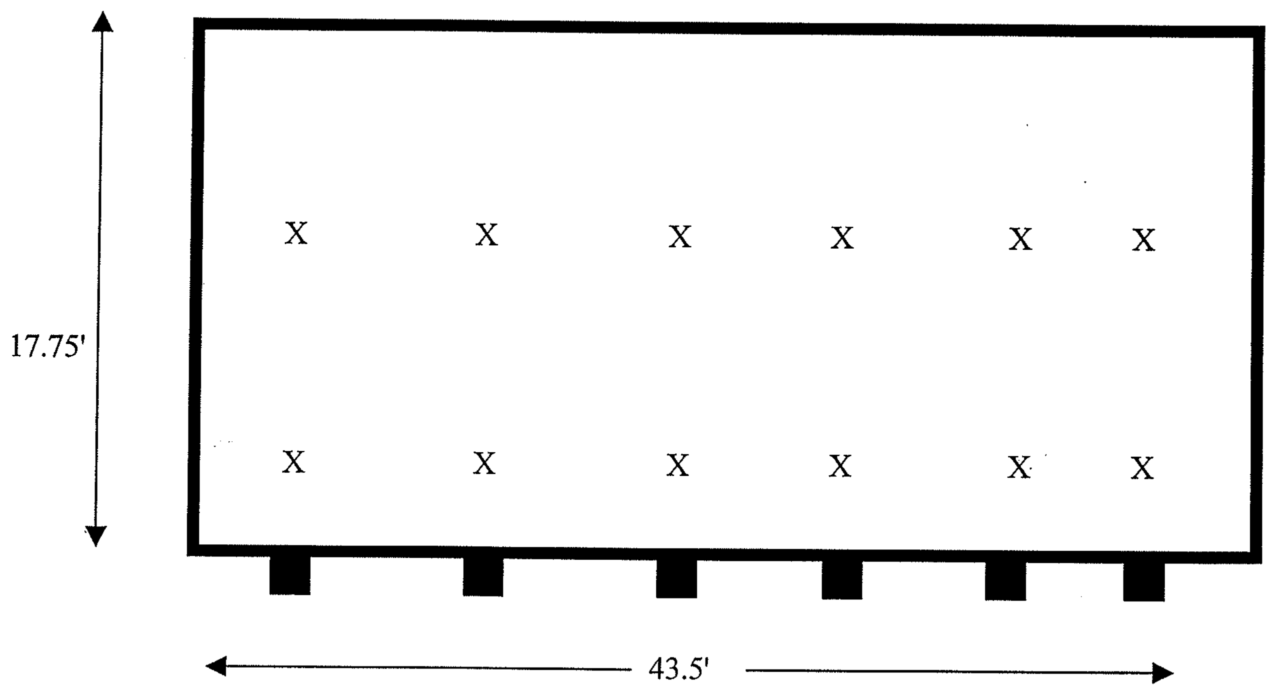
Unit No: 6 ESP Outlet

Length: 15'

Width: 10' (each of four sections)

Area: 600 Square Feet

EQUAL AREA TRAVERSE FOR RECTANGULAR DUCTS



Job: AEP Conesville – ADA

Date: March 14 through 17, 2006

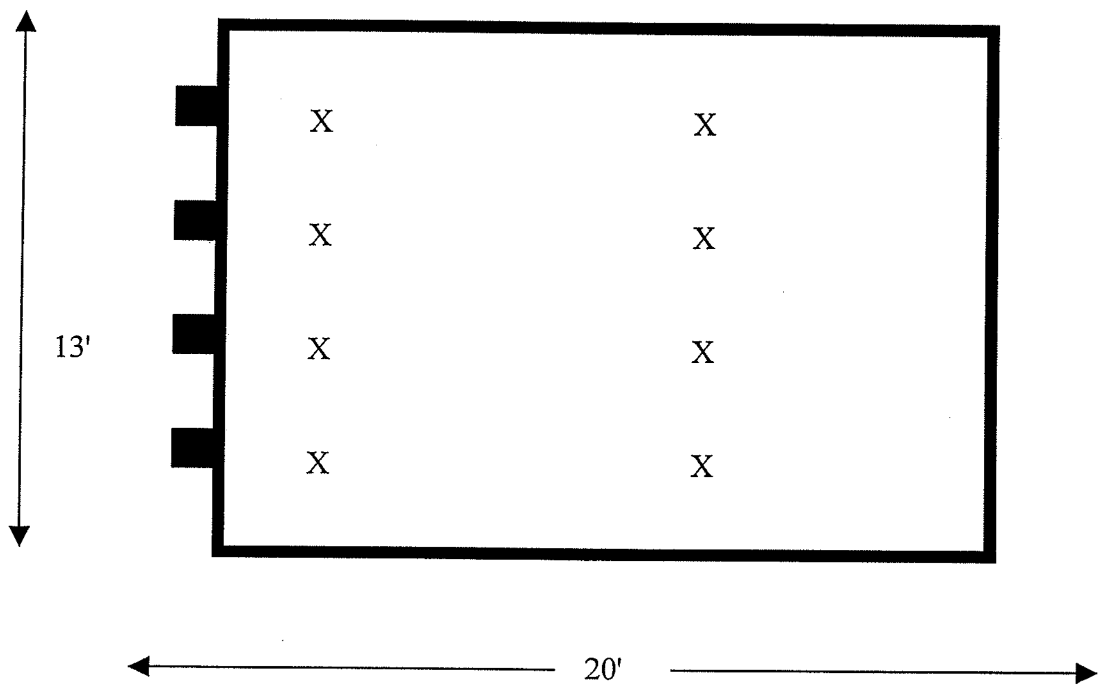
Unit No: 6 ESP Inlet

Length: 17.75'

Width: 43.5'

Area: 772.125 Square Feet

EQUAL AREA TRAVERSE FOR RECTANGULAR DUCTS



Job: AEP Conesville – ADA

Date: March 14 through 17, 2006

Unit No: 6 FGD Outlet

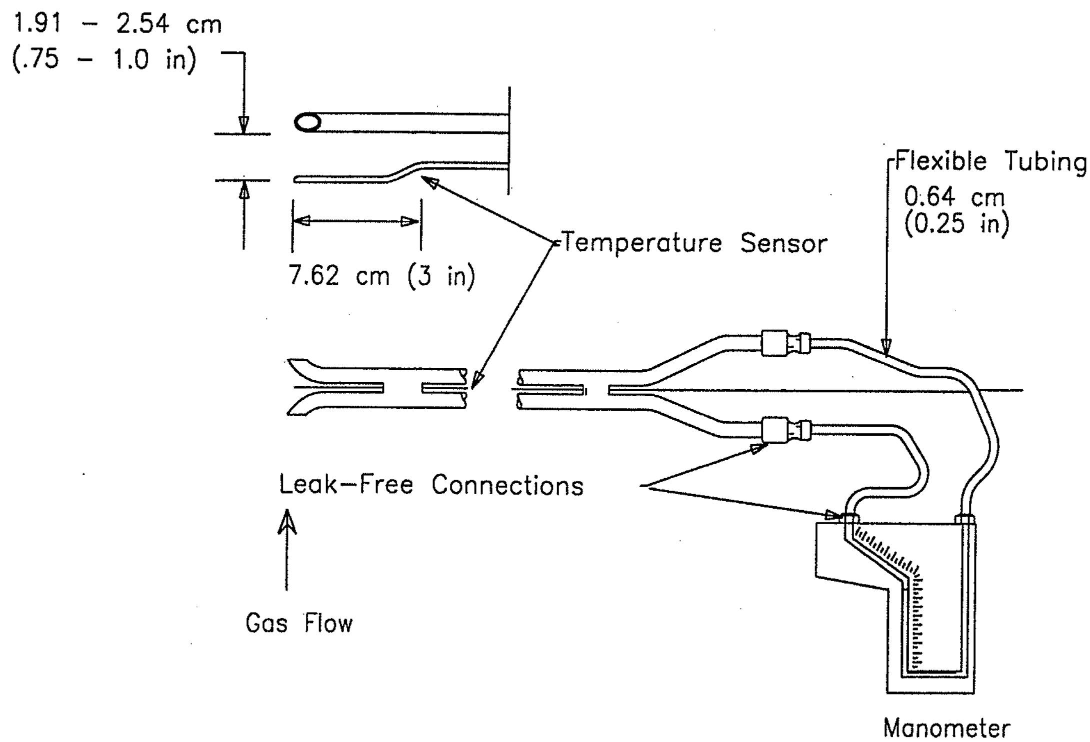
Length: 13' (each of two sections)

Width: 20'

Area: 520 Square Feet

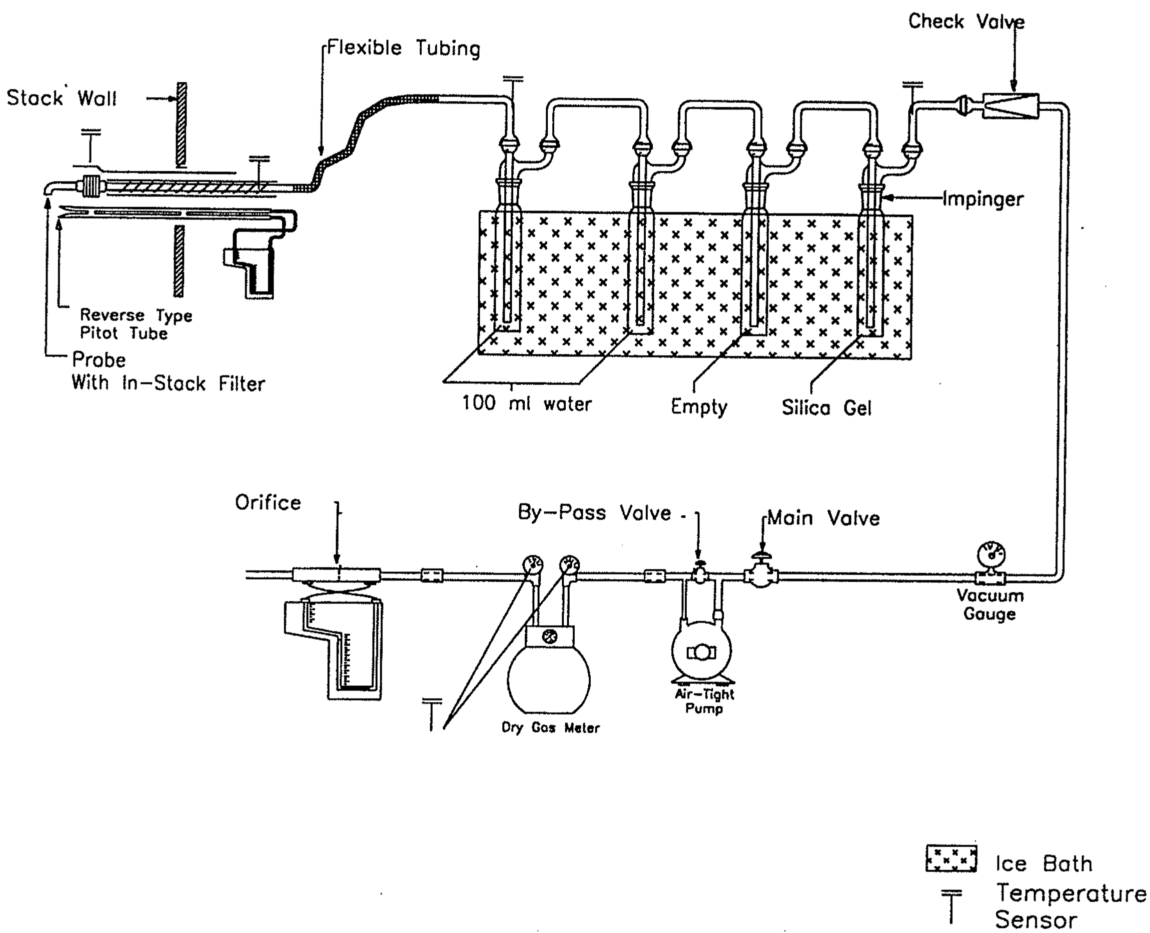
S-Type Pitot Tube Manometer Assembly

USEPA Method 2



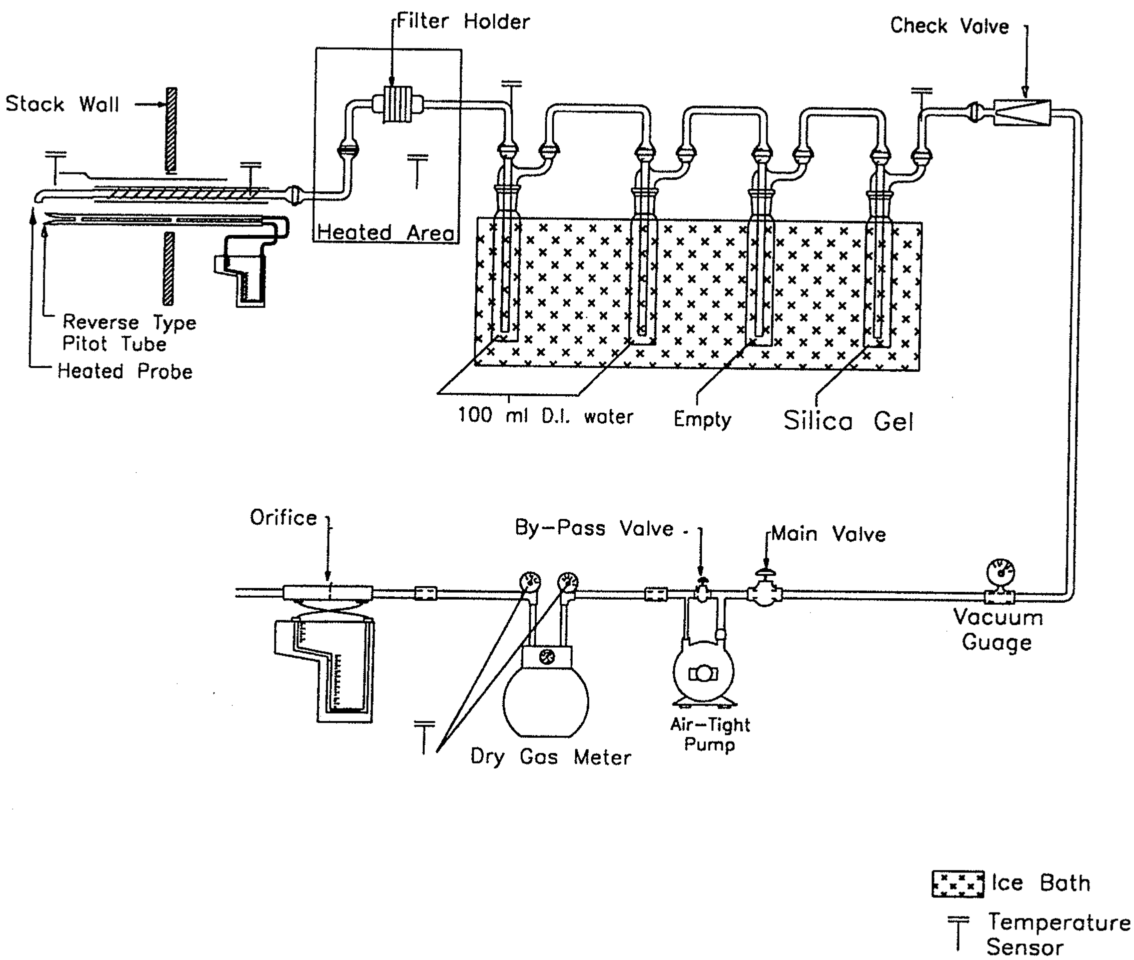
Particulate Sampling Train Equipped With In-Stack Filter

USEPA Method 17



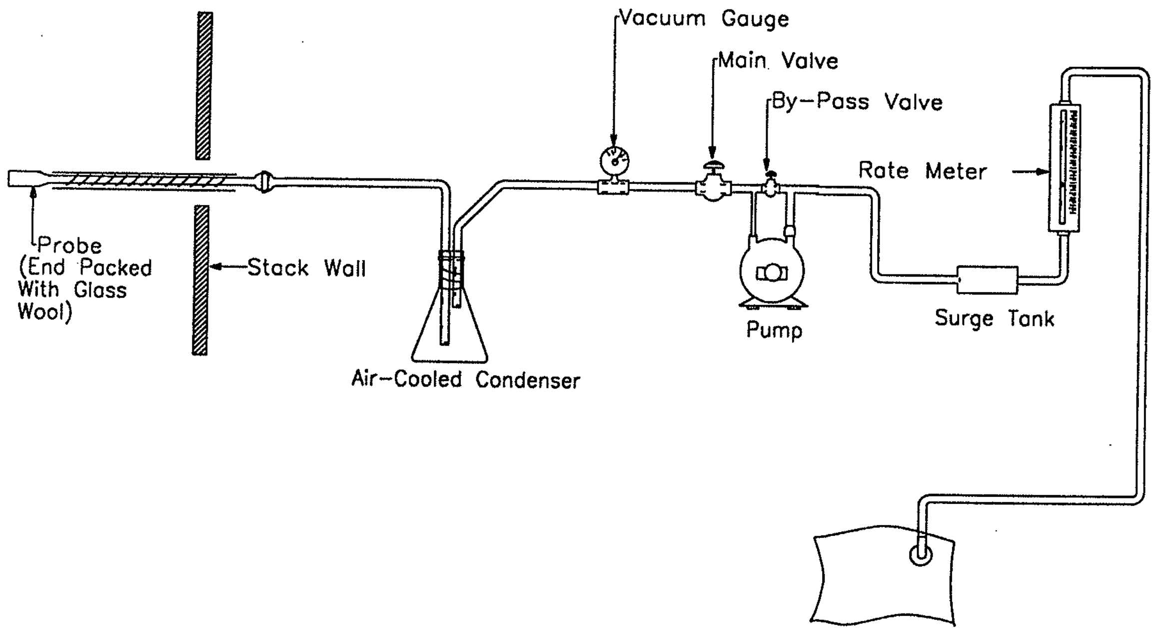
Determination of Particulate Emissions From Stationary Sources

USEPA Method 5

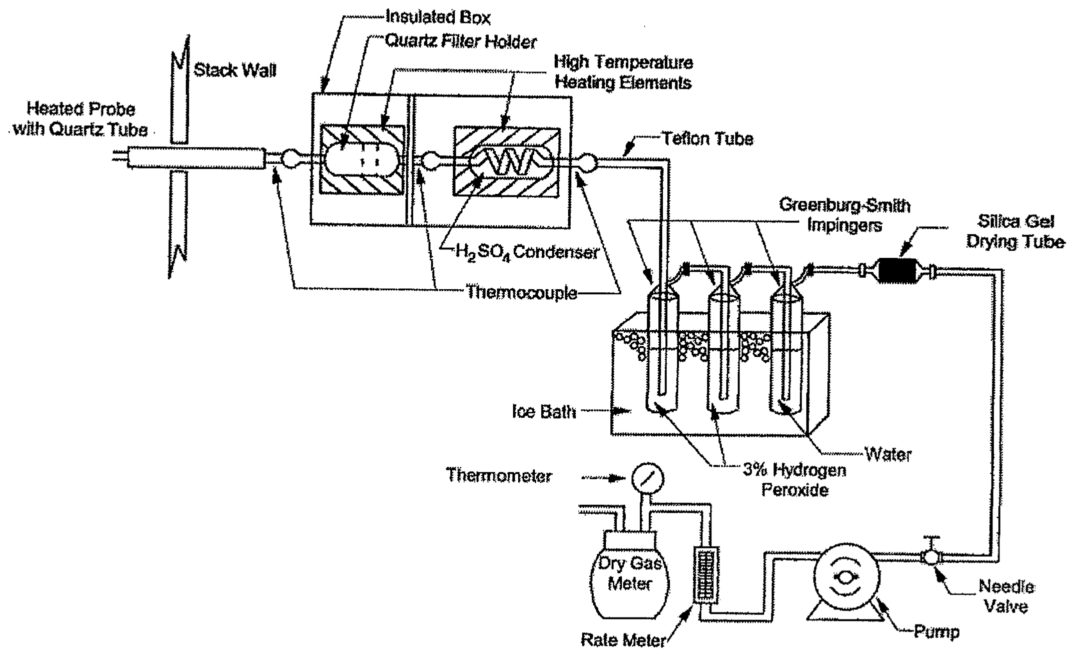


Sampling Train for Integrated Gas Sampling

USEPA Method 3

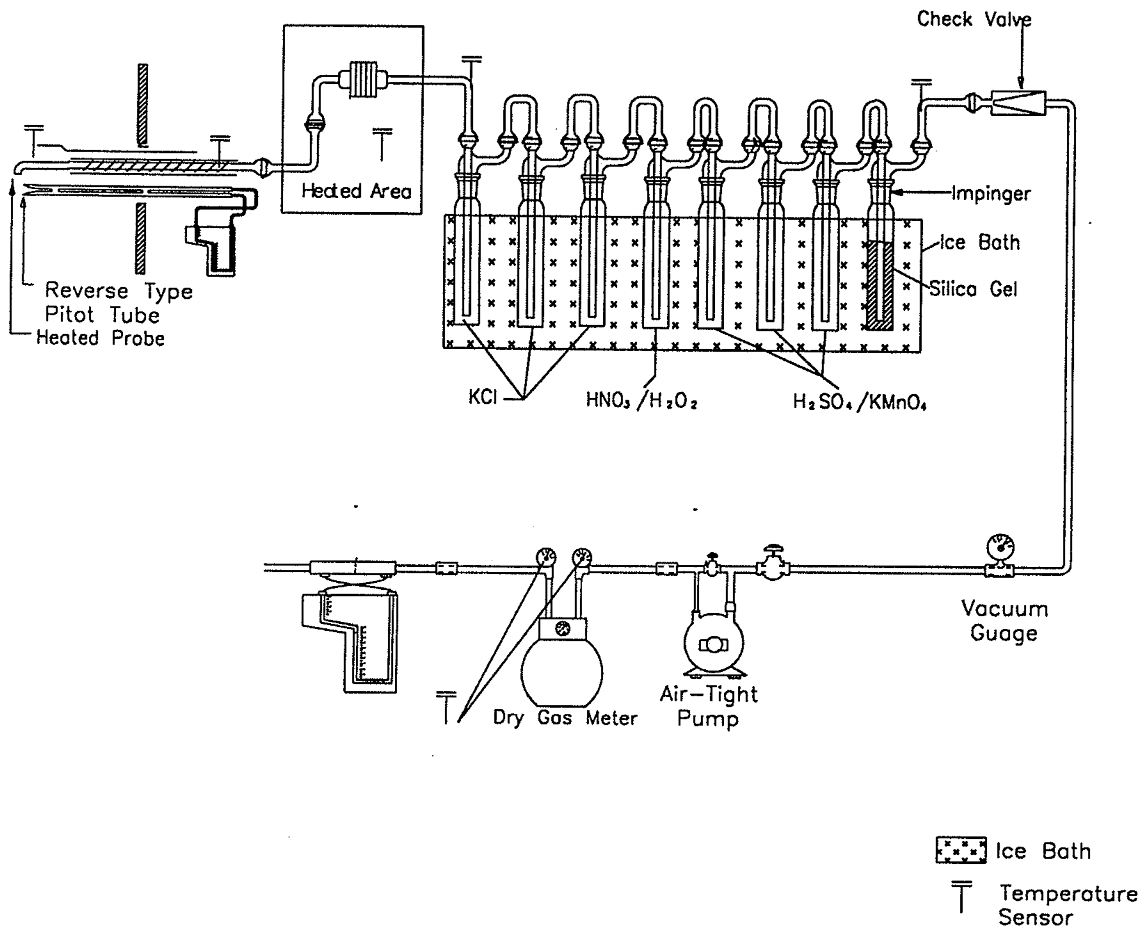


METHOD 8A - DETERMINATION OF SULFURIC ACID VAPOR OR MIST AND SULFUR DIOXIDE EMISSIONS FROM KRAFT RECOVERY FURNACES



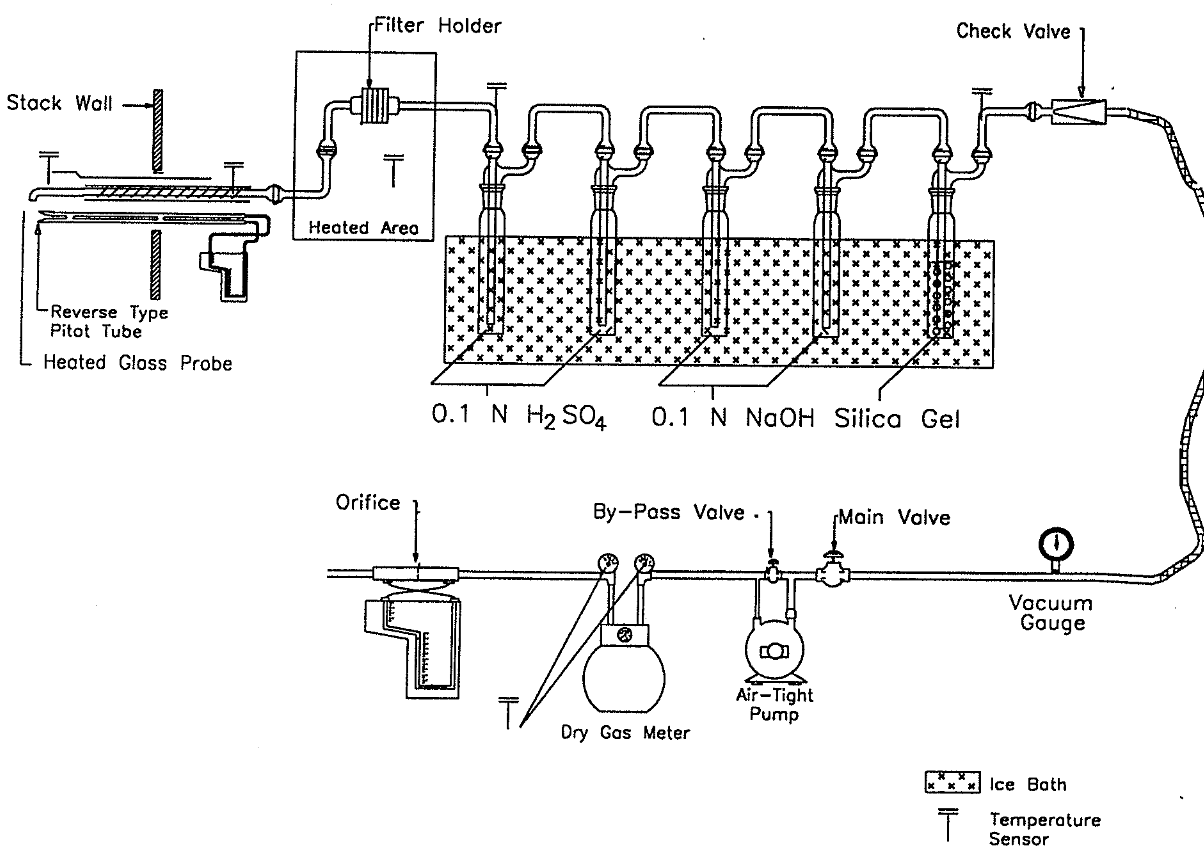
Speciated Mercury Sampling Train Equipped With Out-of-Stack Filter

Ontario Hydro Method



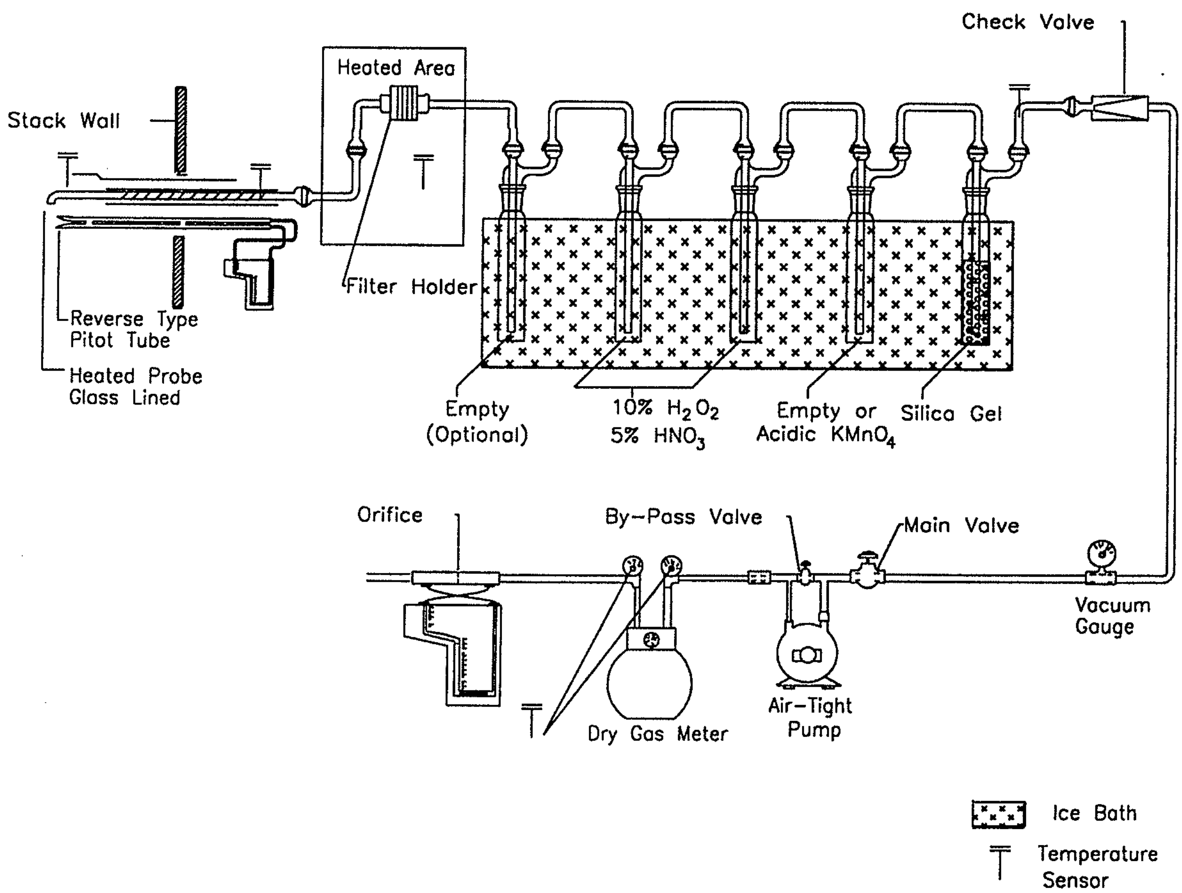
Determination of Hydrogen Chloride Emissions From Stationary Sources

USEPA Method 26A



Determination of Trace Metal Concentrations in Emissions From Stationary Sources

USEPA Method 29



Platt Environmental Services, Inc

CHAIN-OF-CUSTODY RECORD

Project Number: **PE2006043**	Date Results Required:
Client: **ADA-ES**	TAT Required:
Plant/Location: **AEP-Conesville/ Unit 6 ESP Inlet, ESP Outlet, and FGD Outlet**	PO Number:
Project Supervisor: **Eric Ehlers**	

Sample Number	Date Sampled	Sample Point Identification	# of Conts	Grab/Comp	Analysis Requested	Sub Lab
001	**3/14/06**	**U6 ESP In 0.1N H_2SO_4 Imps T #1**	**1**		**M26A (HCl, HF, HBr)**	291.0
002	**3/14/06**	**U6 ESP In 0.1N H_2SO_4 Imps T #2**	**1**		**Do Not Analyze**	N/A
003	**3/14/06**	**U6 ESP In 0.1N H_2SO_4 Imps T #3**	**1**		**M26A (HCl, HF, HBr)**	333.2
004	**3/14/06**	**U6 ESP In 0.1N H_2SO_4 Imps T #4**	**1**		**M26A (HCl, HF, HBr)**	306.2
005	**3/14/06**	**U6 ESP In 0.1N NaOH Imps T #1**	**1**		**M26A (Br_2, Cl_2)**	280.0
006	**3/14/06**	**U6 ESP In 0.1N NaOH Imps T #2**	**1**		**Do Not Analyze**	N/A
007	**3/14/06**	**U6 ESP In 0.1N NaOH Imps T #3**	**1**		**M26A (Br_2, Cl_2)**	231.4
008	**3/14/06**	**U6 ESP In 0.1N NaOH Imps T #4**	**1**		**M26A (Br_2, Cl_2)**	223.6
009	**3/14/06**	**U6 ESP Out 0.1N H_2SO_4 Imps T #1**	**1**		**M26A (HCl, HF, HBr)**	243.2
010	**3/14/06**	**U6 ESP Out 0.1N H_2SO_4 Imps T #2**	**1**		**M26A (HCl, HF, HBr)**	240.7
011	**3/14/06**	**U6 ESP Out 0.1N H_2SO_4 Imps T #3**	**1**		**M26A (HCl, HF, HBr)**	292.8
012	**3/14/06**	**U6 ESP Out 0.1N H_2SO_4 Imps T #4**	**1**		**M26A (HCl, HF, HBr)**	254.0
013	**3/14/06**	**U6 ESP Out 0.1N NaOH Imps T #1**	**1**		**M26A (Br_2, Cl_2)**	254.6
014	**3/14/06**	**U6 ESP Out 0.1N NaOH Imps T #2**	**1**		**M26A (Br_2, Cl_2)**	263.6
015	**3/14/06**	**U6 ESP Out 0.1N NaOH Imps T #3**	**1**		**M26A (Br_2, Cl_2)**	229.2
016	**3/14/06**	**U6 ESP Out 0.1N NaOH Imps T #4**	**1**		**M26A (Br_2, Cl_2)**	188.2

Delivered by:	Date/Time	Processed by:	Date/Time	Received by Laboratory:

Special Instructions:

Platt Environmental Services, Inc

CHAIN-OF-CUSTODY RECORD

Project Number: **PE2006043**	Date Results Required:
Client: **ADA-ES**	TAT Required:
Plant/Location: **AEP-Conesville/ Unit 6 ESP Inlet, ESP Outlet, and FGD Outlet**	PO Number:
Project Supervisor: **Eric Ehlers**	

Sample Number	Date Sampled	Sample Point Identification	# of Conts	Grab/ Comp	Analysis Requested	Volume (mls)
017	3/14/06	U6 ESP In M17 Thimble T#1	1		M17	
018	3/14/06	U6 ESP In M17 Thimble T#2	1		Do not analyze	
019	3/14/06	U6 ESP In M17 Thimble T#3	1		M17	
020	3/14/06	U6 ESP In M17 Thimble T#4	1		M17	
021	3/14/06	U6 ESP Out Acetone Probe Wash and Filter T#1	3		M5	
022	3/14/06	U6 ESP Out Acetone Probe Wash and Filter T#2	2		M5	
023	3/14/06	U6 ESP Out Acetone Probe Wash and Filter T#3	2		M5	
024	3/14/06	U6 ESP Out Acetone Probe Wash and Filter T#4	2		M5	
025	3/15/06	U6 ESP In 0.1N HNO_3 Nozzle Rinse and Thimble T#1	2		M29 (Selenium, Arsenic, Hg)	39.6
026	3/15/06	U6 ESP In 0.1N HNO_3 Nozzle Rinse and Thimble T#2	2		M29 (Selenium, Arsenic, Hg)	44.8
027	3/15/06	U6 ESP In 0.1N HNO_3 Nozzle Rinse and Thimble T#3	2		M29 (Selenium, Arsenic, Hg)	25.4
028	3/15/06	U6 ESP In HNO_3/H_20_2 Imps T#1	1		M29 (Selenium, Arsenic, Hg)	430.4
029	3/15/06	U6 ESP In HNO_3/H_20_2 Imps T#2	1		M29 (Selenium, Arsenic, Hg)	440.6
030	3/15/06	U6 ESP In HNO_3/H_20_2 Imps T#3	1		M29 (Selenium, Arsenic, Hg)	400.2
031	3/15/06	U6 ESP In $KMNO_4/H_2SO_4$ Imps T#1	1		M29 (Hg only)	298.4
032	3/15/06	U6 ESP In $KMNO_4/H_2SO_4$ Imps T#2	1		M29 (Hg only)	332.4

Delivered by:	Date/Time	Processed by:	Date/Time	Received by Laboratory:

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Plant/Location: **AEP-Conesville/ Unit 6 ESP Inlet, ESP Outlet, and FGD Outlet**	PO Number:
Project Supervisor: **Eric Ehlers**	

Sample Number	Date Sampled	Sample Point Identification	# of Conts	Grab/ Comp	Analysis Requested	Volume (mls)
033	3/15/06	U6 ESP In $KMNO_4/H_2SO_4$ Imps T#3	1		M29 (Hg only)	329.4
034	3/15/06	U6 ESP Out 0.1N HNO_3 Probe Rinse and Filter T#1	2		M29 (Selenium, Arseinc, Hg)	31.2
035	3/15/06	U6 ESP Out 0.1N HNO_3 Probe Rinse and Filter T#2	2		M29 (Selenium, Arsenic, Hg)	28.2
036	3/15/06	U6 ESP Out 0.1N HNO_3 Probe Rinse and Filter T#3	2		M29 (Selenium, Arsenic, Hg)	19.0
037	3/15/06	U6 ESP Out HNO_3/H_20_2 Imps T#1	1		M29 (Selenium, Arsenic, Hg)	395.4
038	3/15/06	U6 ESP Out HNO_3/H_20_2 Imps T#2	1		M29 (Selenium, Arsenic, Hg)	385.4
039	3/15/06	U6 ESP Out HNO_3/H_20_2 Imps T#3	1		M29 (Selenium, Arsenic, Hg)	364.4
040	3/15/06	U6 ESP Out $KMNO_4/H_2SO_4$ Imps T#1	1		M29 (Hg only)	278.6
041	3/15/06	U6 ESP Out $KMNO_4/H_2SO_4$ Imps T#2	1		M29 (Hg only)	323.0
042	3/15/06	U6 ESP Out $KMNO_4/H_2SO_4$ Imps T#3	1		M29 (Hg only)	289.6
043	3/15/06	U6 ESP In 0.1N HNO_3 Nozzle Rinse and Thimble T#1	2		Do Not Analyze	N/A
044	3/16/06	U6 ESP In 0.1N HNO_3 Nozzle Rinse and Thimble T#2	2		Ontario Hydro	37.4
045	3/16/06	U6 ESP In 0.1N HNO_3 Nozzle Rinse and Thimble T#3	2		Ontario Hydro	33.8
046	3/17/06	U6 ESP In 0.1N HNO_3 Nozzle Rinse and Thimble T#4	2		Ontario Hydro	39.2
047	3/17/06	U6 ESP In 0.1N HNO_3 Nozzle Rinse and Thimble T#5	2		Ontario Hydro	34.2
048	3/15/06	U6 ESP In KCl Imps T#1	1		Do Not Analyze	N/A

Delivered by:	Date/Time	Processed by:	Date/Time	Received by Laboratory:

Platt Environmental Services, Inc

CHAIN-OF-CUSTODY RECORD

Project Number: **PE2006043**	Date Results Required:
Client: **ADA-ES**	TAT Required:
Plant/Location: **AEP-Conesville/ Unit 6 ESP Inlet, ESP Outlet, and FGD Outlet**	PO Number:
Project Supervisor: **Eric Ehlers**	

Sample Number	Date Sampled	Sample Point Identification	# of Conts	Grab/ Comp	Analysis Requested	Volume (mls)
049	3/16/06	U6 ESP In KCl Imps T#2	1*		Ontario Hydro	488.8
050	3/16/06	U6 ESP In KCl Imps T#3	1*		Ontario Hydro	469.4
051	3/17/06	U6 ESP In KCl Imps T#4	1		Ontario Hydro	467.8
051A	3/17/06	U6 ESP In KCl Imps T#5	1		Ontario Hydro	484.4
052	3/15/06	U6 ESP In HNO_3/H_20_2 Imp T#1	1		Do Not Analyze	N/A
053	3/16/06	U6 ESP In HNO_3/H_20_2 Imp T#2	1*		Ontario Hydro	131.2
054	3/16/06	U6 ESP In HNO_3/H_20_2 Imp T#3	1*		Ontario Hydro	128.0
055	3/17/06	U6 ESP In HNO_3/H_20_2 Imp T#4	1		Ontario Hydro	137.0
055A	3/17/06	U6 ESP In HNO_3/H_20_2 Imp T#5	1		Ontario Hydro	127.8
056	3/15/06	U6 ESP In $KMNO_4/H_2SO_4$ Imps T#1	1		Do Not Analyze	N/A
057	3/16/06	U6 ESP In $KMNO_4/H_2SO_4$ Imps T#2	1*		Ontario Hydro	444.4
058	3/16/06	U6 ESP In $KMNO_4/H_2SO_4$ Imps T#3	1*		Ontario Hydro	411.8
059	3/17/06	U6 ESP In $KMNO_4/H_2SO_4$ Imps T#4	1		Ontario Hydro	447.2
059A	3/17/06	U6 ESP In $KMNO_4/H_2SO_4$ Imps T#5	1		Ontario Hydro	402.4
060	3/15/06	U6 ESP Out 0.1N HNO_3 Probe Rinse and Filter T#1	2		Do Not Analyze	N/A
061	3/16/06	U6 ESP Out 0.1N HNO_3 Probe Rinse and Filter T#2	2		Ontario Hydro	9.4
062	3/16/06	U6 ESP Out 0.1N HNO_3 Probe Rinse and Filter T#3	2		Ontario Hydro	23.4
063	3/17/06	U6 ESP Out 0.1N HNO_3 Probe Rinse and Filter T#4	2		Ontario Hydro	23.8
064	3/15/06	U6 ESP Out KCl Imps T#1	1		Do Not Analyze	N/A
065	3/16/06	U6 ESP Out KCl Imps T#2	1*		Ontario Hydro	440.6

Platt Environmental Services, Inc

CHAIN-OF-CUSTODY RECORD

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Plant/Location: **AEP-Conesville/ Unit 6 ESP Inlet, ESP Outlet, and FGD Outlet**	PO Number:
Project Supervisor: **Eric Ehlers**	

Sample Number	Date Sampled	Sample Point Identification	# of Conts	Grab/ Comp	Analysis Requested	Volume (mls)
066	3/16/06	U6 ESP Out KCl Imps T#3	1*		Ontario Hydro	405.8
067	3/17/06	U6 ESP Out KCl Imps T#4	1		Ontario Hydro	427.8
068	3/15/06	U6 ESP Out HNO_3/H_20_2 Imp T#1	1		Do Not Analyze	N/A
069	3/16/06	U6 ESP Out HNO_3/H_20_2 Imp T#2	1*		Ontario Hydro	137.8
070	3/16/06	U6 ESP Out HNO_3/H_20_2 Imp T#3	1*		Ontario Hydro	124.6
071	3/17/06	U6 ESP Out HNO_3/H_20_2 Imp T#3	1		Ontario Hydro	134.2
072	3/15/06	U6 ESP Out $KMNO_4/H_2SO_4$ Imps T#1	1		Do Not Analyze	N/A
073	3/16/06	U6 ESP Out $KMNO_4/H_2SO_4$ Imps T#2	1*		Ontario Hydro	488.6
074	3/16/06	U6 ESP Out $KMNO_4/H_2SO_4$ Imps T#3	1*		Ontario Hydro	462.6
075	3/17/06	U6 ESP Out $KMNO_4/H_2SO_4$ Imps T#4	1		Ontario Hydro	471.4
076	3/17/06	U6 FGD Out 0.1N HNO_3 Probe Rinse and Filter T#1	2		Ontario Hydro	16.8
077	3/17/06	U6 FGD Out 0.1N HNO_3 Probe Rinse and Filter T#2	2		Ontario Hydro	14.2
078	3/17/06	U6 FGD Out 0.1N HNO_3 Probe Rinse and Filter T#3	2		Ontario Hydro	15.2
079	3/17/06	U6 FGD Out KCl Imps T#1	1		Ontario Hydro	481.8
080	3/17/06	U6 FGD Out KCl Imps T#2	1		Ontario Hydro	484.4
081	3/17/06	U6 FGD Out KCl Imps T#3	1		Ontario Hydro	424.0

Delivered by:	Date/Time	Processed by:	Date/Time	Received by Laboratory:

Platt Environmental Services, Inc

CHAIN-OF-CUSTODY RECORD

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Plant/Location: **AEP-Conesville/ Unit 6 ESP Inlet, ESP Outlet, and FGD Outlet**	PO Number:
Project Supervisor: **Eric Ehlers**	

Sample Number	Date Sampled	Sample Point Identification	# of Conts	Grab/ Comp	Analysis Requested	Volume (mls)
082	3/17/06	U6 FGD Out HNO_3/H_2O_2 Imp T#1	1		Ontario Hydro	121.0
083	3/17/06	U6 FGD Out HNO_3/H_2O_2 Imp T#2	1		Ontario Hydro	129.2
084	3/17/06	U6 FGD Out HNO_3/H_2O_2 Imp T#3	1		Ontario Hydro	113.8
085	3/17/06	U6 FGD Out $KMNO_4/H_2SO_4$ Imps T#1	1		Ontario Hydro	416.8
086	3/17/06	U6 FGD Out $KMNO_4/H_2SO_4$ Imps T#2	1		Ontario Hydro	445.2
087	3/17/06	U6 FGD Out $KMNO_4/H_2SO_4$ Imps T#3	1		Ontario Hydro	454.6
088	3/16/06	U6 ESP In Condenser Coil Rinse T#1	1		NCASI Method 8A (SO3)	
089	3/16/06	U6 ESP In Condenser Coil Rinse T#2	1		NCASI Method 8A (SO3)	
090	3/16/06	U6 ESP In Condenser Coil Rinse T#3	1		NCASI Method 8A (SO3)	
091	3/16/06	U6 ESP Out Coil Rinse T#1	1		NCASI Method 8A (SO3)	
092	3/16/06	U6 ESP Out Coil Rinse T#2	1		NCASI Method 8A (SO3)	
093	3/16/06	U6 ESP Out Coil Rinse T#3	1		NCASI Method 8A (SO3)	
094	3/17/06	KCl reagent blank	1		Ontario Hydro	53.2
095	3/17/06	HNO_3/H_2O_2 reagent blank	1		Ontario Hydro	50.0
096	3/17/06	$KMNO_4/H_2SO_4$ reagent blank	1		Ontario Hydro	57.1
097	3/17/06	0.1 N HNO_3 reagent blank	1		Ontario Hydro	58.0

Delivered by:	Date/Time	Processed by:	Date/Time	Received by Laboratory:

Special Instructions:

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Plant/Location: **AEP-Conesville/ Unit 6 ESP Inlet, ESP Outlet, and FGD Outlet**	PO Number:
Project Supervisor: **Eric Ehlers**	

Sample Number	Date Sampled	Sample Point Identification	# of Conts	Grab/ Comp	Analysis Requested	Volume (mls)
098	3/17/06	10% Hydroxamaline Hydrochloride Reagent blank	1		Ontario Hydro	40.0
099	3/16/06	Sample Filter Blank	1		Ontario Hydro	
100	3/16/06	U 6 ESP In KCl Imps Field Blank	1		Ontario Hydro	
101	3/16/06	U 6 ESP In HNO3/H2O2 Field Blank	1		Ontario Hydro	
102	3/16/06	U 6 ESP In KMnO4/H2SO4 Field Blank	1		Ontario Hydro	
103	3/16/06	U 6 ESP Out KCl Imps Field Blank	1		Ontario Hydro	
104	3/16/06	U 6 ESP Out HNO3/H2O2 Field Blank	1		Ontario Hydro	
105	3/16/06	U 6 ESP Out KMnO4/H2SO4 Field Blank	1		Ontario Hydro	
106	3/17/06	U 6 FGD Out KCl Imps Field Blank	1		Ontario Hydro	
107	3/17/06	U 6 FGD Out HNO3/H2O2 Field Blank	1		Ontario Hydro	
108	3/17/06	U 6 FGD Out KMnO4/H2SO4 Field Blank	1		Ontario Hydro	
109	3/17/06	0.1 N NaOH Blank	1		26A	
110	3/17/06	0.1 N H2SO4 Blank	1		26A	
111						
112						
113						

Delivered by:	Date/Time	Processed by:	Date/Time	Received by Laboratory:

LABORATORY REPORT

TEI Analytical, Inc.
7177 N. Austin
Niles, IL 60714-4617
847-647-1345

PREPARED FOR:

Jim Platt
Platt Environmental Services Inc.
371 Balm Court
Wood Dale, IL 60191

Report #: 71372
Report Date: 4/12/2006
Sample Received:
3/20/06 11:23

PE2006043

TEI Number: 71372 Sample: 001

TEST	RESULTS		DATE PERFORMED
HBr (M26A)	1.16	mg	3/24/2006
HCl (M26A)	28.5	mg	3/24/2006
HF (M26A)	0.94	mg	3/24/2006

TEI Number: 71373 Sample: 003

TEST	RESULTS		DATE PERFORMED
HBr (M26A)	2.25	mg	3/24/2006
HCl (M26A)	117	mg	3/24/2006
HF (M26A)	2.41	mg	3/24/2006

TEI Number: 71374 Sample: 004

TEST	RESULTS		DATE PERFORMED
HBr (M26A)	2.30	mg	3/24/2006
HCl (M26A)	117	mg	3/24/2006
HF (M26A)	2.01	mg	3/24/2006

G. E. O'Neill
Gayle E. O'Neill, Ph.D.

LABORATORY REPORT

TEI Analytical, Inc.
7177 N. Austin
Niles, IL 60714-4617
847-647-1345

PREPARED FOR:

Jim Platt
Platt Environmental Services Inc.
371 Balm Court
Wood Dale, IL 60191

Report #: 71372
Report Date: 4/12/2006
Sample Received:
3/20/06 11:23

PE2006043

TEI Number: 71375 Sample: 005

TEST	RESULTS		DATE PERFORMED
Bromine (M26A)	2.40	mg	3/24/2006
Chlorine (M26A)	117	mg	3/24/2006

TEI Number: 71376 Sample: 007

TEST	RESULTS		DATE PERFORMED
Bromine (M26A)	<0.2	mg	3/24/2006
Chlorine (M26A)	<0.1	mg	3/24/2006

TEI Number: 71377 Sample: 008

TEST	RESULTS		DATE PERFORMED
Bromine (M26A)	<0.2	mg	3/24/2006
Chlorine (M26A)	0.57	mg	3/24/2006

TEI Number: 71378 Sample: 009

TEST	RESULTS		DATE PERFORMED
HBr (M26A)	0.92	mg	3/24/2006
HCl (M26A)	22.4	mg	3/24/2006
HF (M26A)	1.11	mg	3/24/2006

G. E. O'Neill

Gayle E. O'Neill, Ph.D.

LABORATORY REPORT

TEI Analytical, Inc.
7177 N. Austin
Niles, IL 60714-4617
847-647-1345

PREPARED FOR:

Jim Platt
Platt Environmental Services Inc.
371 Balm Court
Wood Dale, IL 60191

Report #: 71372
Report Date: 4/12/2006
Sample Received:
3/20/06 11:23

PE2006043

TEI Number: 71379 Sample: 010

TEST	RESULTS		DATE PERFORMED
HBr (M26A)	0.33	mg	3/24/2006
HCl (M26A)	12.1	mg	3/24/2006
HF (M26A)	0.85	mg	3/24/2006

TEI Number: 71380 Sample: 011

TEST	RESULTS		DATE PERFORMED
HBr (M26A)	1.93	mg	3/24/2006
HCl (M26A)	168	mg	3/24/2006
HF (M26A)	3.72	mg	3/24/2006

TEI Number: 71381 Sample: 012

TEST	RESULTS		DATE PERFORMED
HBr (M26A)	1.14	mg	3/24/2006
HCl (M26A)	115	mg	3/24/2006
HF (M26A)	2.50	mg	3/24/2006

g. e. O'Neill

Gayle E. O'Neill, Ph.D.

LABORATORY REPORT

TEI Analytical, Inc.
7177 N. Austin
Niles, IL 60714-4617
847-647-1345

PREPARED FOR:

Jim Platt
Platt Environmental Services Inc.
371 Balm Court
Wood Dale, IL 60191

Report #: 71372
Report Date: 4/12/2006
Sample Received:
3/20/06 11:23

PE2006043

TEI Number: 71382 Sample: 013

TEST	RESULTS		DATE PERFORMED
Bromine (M26A)	1.32	mg	3/24/2006
Chlorine (M26A)	105	mg	3/24/2006

TEI Number: 71383 Sample: 014

TEST	RESULTS		DATE PERFORMED
Bromine (M26A)	1.49	mg	3/24/2006
Chlorine (M26A)	77.4	mg	3/24/2006

TEI Number: 71384 Sample: 015

TEST	RESULTS		DATE PERFORMED
Bromine (M26A)	<0.2	mg	3/24/2006
Chlorine (M26A)	4.77	mg	3/24/2006

TEI Number: 71385 Sample: 016

TEST	RESULTS		DATE PERFORMED
Bromine (M26A)	<0.2	mg	3/24/2006
Chlorine (M26A)	2.52	mg	4/7/2006

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PE2006043

TEI Number: 71386 Sample: 025

TEST	RESULTS		DATE PERFORMED
Preparation (M-29)			3/28/2006
Arsenic (7060A)	51	ug	3/29/2006
Mercury (245.1)	0.06	ug	4/6/2006
Selenium (7740)	156	ug	3/29/2006

TEI Number: 71387 Sample: 026

TEST	RESULTS		DATE PERFORMED
Preparation (M-29)			3/28/2006
Arsenic (7060A)	365	ug	3/29/2006
Mercury (245.1)	0.05	ug	4/6/2006
Selenium (7740)	158	ug	3/29/2006

TEI Number: 71388 Sample: 027

TEST	RESULTS		DATE PERFORMED
Preparation (M-29)			3/28/2006
Arsenic (7060A)	302	ug	3/29/2006
Mercury (245.1)	0.09	ug	4/6/2006
Selenium (7740)	1160	ug	3/29/2006

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TEI Number: 71389 Sample: 028

TEST	RESULTS		DATE PERFORMED
Preparation (M-29)			3/28/2006
Arsenic (7060A)	24	ug	4/11/2006
Mercury (245.1)	23.4	ug	3/31/2006
Selenium (7740)	92	ug	3/29/2006

TEI Number: 71390 Sample: 029

TEST	RESULTS		DATE PERFORMED
Preparation (M-29)			3/28/2006
Arsenic (7060A)	11	ug	4/11/2006
Mercury (245.1)	22.0	ug	3/31/2006
Selenium (7740)	74	ug	3/29/2006

TEI Number: 71391 Sample: 030

TEST	RESULTS		DATE PERFORMED
Preparation (M-29)			3/28/2006
Arsenic (7060A)	9.7	ug	4/11/2006
Mercury (245.1)	22.6	ug	3/31/2006
Selenium (7740)	55	ug	3/29/2006

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TEI Number: 71392 Sample: 031

TEST	RESULTS		DATE PERFORMED
Preparation (M-29)			3/22/2006
Mercury (245.1)	14.9	ug	3/30/2006

TEI Number: 71393 Sample: 032

TEST	RESULTS		DATE PERFORMED
Preparation (M-29)			3/22/2006
Mercury (245.1)	9.41	ug	3/30/2006

TEI Number: 71394 Sample: 033

TEST	RESULTS		DATE PERFORMED
Preparation (M-29)			3/22/2006
Mercury (245.1)	11.3	ug	3/30/2006

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TEI Number: 71395 Sample: 034

TEST	**RESULTS**		**DATE PERFORMED**
Preparation (M-29)			3/28/2006
Arsenic (7060A)	57	ug	3/29/2006
Mercury (245.1)	0.07	ug	4/6/2006
Selenium (7740)	79	ug	3/29/2006

TEI Number: 71396 Sample: 035

TEST	**RESULTS**		**DATE PERFORMED**
Preparation (M-29)			3/28/2006
Arsenic (7060A)	47	ug	3/29/2006
Mercury (245.1)	0.06	ug	4/6/2006
Selenium (7740)	76	ug	3/29/2006

TEI Number: 71397 Sample: 036

TEST	**RESULTS**		**DATE PERFORMED**
Preparation (M-29)			3/28/2006
Arsenic (7060A)	28	ug	3/29/2006
Mercury (245.1)	<0.03	ug	4/6/2006
Selenium (7740)	54	ug	3/29/2006

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TEI Number: 71398 Sample: 037

TEST	RESULTS		DATE PERFORMED
Preparation (M-29)			3/28/2006
Arsenic (7060A)	14	ug	4/11/2006
Mercury (245.1)	37.0	ug	3/31/2006
Selenium (7740)	200	ug	3/29/2006

TEI Number: 71399 Sample: 038

TEST	RESULTS		DATE PERFORMED
Preparation (M-29)			3/28/2006
Arsenic (7060A)	7.5	ug	4/11/2006
Mercury (245.1)	19.7	ug	3/30/2006
Selenium (7740)	77	ug	3/29/2006

TEI Number: 71400 Sample: 039

TEST	RESULTS		DATE PERFORMED
Preparation (M-29)			3/28/2006
Arsenic (7060A)	8.8	ug	4/11/2006
Mercury (245.1)	26.4	ug	3/31/2006
Selenium (7740)	127	ug	3/29/2006

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TEI Number: 71401 Sample: 040

TEST	RESULTS		DATE PERFORMED
Preparation (M-29)			3/22/2006
Mercury (245.1)	6.25	ug	3/30/2006

TEI Number: 71402 Sample: 041

TEST	RESULTS		DATE PERFORMED
Preparation (M-29)			3/22/2006
Mercury (245.1)	10.0	ug	3/30/2006

TEI Number: 71403 Sample: 042

TEST	RESULTS		DATE PERFORMED
Preparation (M-29)			3/22/2006
Mercury (245.1)	5.71	ug	3/30/2006

TEI Number: 71404 Sample: 044

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	0.018 ppm	0.18 ug	3/24/2006

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TEI Number: 71405 Sample: 045

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	0.013 ppm	0.12 ug	3/24/2006

TEI Number: 71406 Sample: 046

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	0.274 ppm	2.01 ug	3/24/2006

TEI Number: 71407 Sample: 047

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	0.893 ppm	5.49 ug	3/24/2006

TEI Number: 71409 Sample: 049

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	17.7	ug	3/31/2006

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TEI Number: 71410 Sample: 050

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	19.7	ug	3/31/2006

TEI Number: 71411 Sample: 051

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	60.5	ug	4/6/2006

TEI Number: 71412 Sample: 051A

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	26.1	ug	4/6/2006

TEI Number: 71413 Sample: 053

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	0.91	ug	4/5/2006

TEI Number: 71414 Sample: 054

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	0.94	ug	4/5/2006

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TEI Number: 71415 Sample: 055

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	0.44	ug	4/5/2006

TEI Number: 71416 Sample: 055A

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	0.69	ug	4/5/2006

TEI Number: 71417 Sample: 057

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	7.92	ug	3/31/2006

TEI Number: 71418 Sample: 058

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	7.58	ug	3/31/2006

TEI Number: 71419 Sample: 059

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	6.68	ug	3/31/2006

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TEI Number: 71420 Sample: 059A

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	7.71	ug	3/31/2006

TEI Number: 71421 Sample: 061

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	<0.005	ug	3/24/2006

TEI Number: 71422 Sample: 062

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	<0.005	ug	3/24/2006

TEI Number: 71423 Sample: 063

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	0.007	ug	3/24/2006

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TEI Number: 71424 Sample: 065

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	18.6	ug	3/31/2006

TEI Number: 71425 Sample: 066

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	27.5	ug	4/6/2006

TEI Number: 71426 Sample: 067

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	77.9	ug	4/6/2006

TEI Number: 71427 Sample: 069

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	0.66	ug	4/5/2006

TEI Number: 71428 Sample: 070

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	0.85	ug	4/5/2006

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TEI Number: 71429 Sample: 071

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	2.57	ug	4/5/2006

TEI Number: 71430 Sample: 073

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	6.94	ug	3/31/2006

TEI Number: 71431 Sample: 074

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	8.01	ug	3/31/2006

TEI Number: 71432 Sample: 075

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	20.0	ug	3/31/2006

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TEI Number: 71433 Sample: 076

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	<0.005	ug	3/24/2006

TEI Number: 71434 Sample: 077

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	<0.005	ug	3/24/2006

TEI Number: 71435 Sample: 078

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	<0.005	ug	3/24/2006

TEI Number: 71436 Sample: 079

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	2.65	ug	3/31/2006

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TEI Number: 71437 Sample: 080

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	0.94	ug	3/31/2006

TEI Number: 71438 Sample: 081

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	0.77	ug	3/31/2006

TEI Number: 71439 Sample: 082

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	0.27	ug	4/5/2006

TEI Number: 71440 Sample: 083

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	<0.1	ug	4/5/2006

TEI Number: 71441 Sample: 084

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	<0.1	ug	4/5/2006

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TEI Number: 71442 Sample: 085

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	13.1	ug	3/31/2006

TEI Number: 71444 Sample: 086

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	13.4	ug	3/31/2006

TEI Number: 71445 Sample: 087

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	6.99	ug	3/31/2006

TEI Number: 71446 Sample: 088

TEST	RESULTS		DATE PERFORMED
Sulfuric Acid (Method 8)	7.3	mg	3/24/2006

TEI Number: 71447 Sample: 089

TEST	RESULTS		DATE PERFORMED
Sulfuric Acid (Method 8)	1.7	mg	3/24/2006

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TEI Number: 71448 Sample: 090

TEST	RESULTS		DATE PERFORMED
Sulfuric Acid (Method 8)	9.3	mg	3/24/2006

TEI Number: 71449 Sample: 091

TEST	RESULTS		DATE PERFORMED
Sulfuric Acid (Method 8)	34.8	mg	3/24/2006

TEI Number: 71450 Sample: 092

TEST	RESULTS		DATE PERFORMED
Sulfuric Acid (Method 8)	26.5	mg	3/24/2006

TEI Number: 71451 Sample: 093

TEST	RESULTS		DATE PERFORMED
Sulfuric Acid (Method 8)	25.3	mg	3/24/2006

TEI Number: 71452 Sample: 094

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	<0.3	ug	3/31/2006

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TEI Number: 71453 Sample: 095

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	<0.1	ug	4/5/2006

TEI Number: 71454 Sample: 096

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	<0.3	ug	3/31/2006

TEI Number: 71455 Sample: 097

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	<0.03	ug	4/5/2006

TEI Number: 71456 Sample: 098

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	0.03	ug	3/31/2006

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TEI Number: 71457 Sample: 099

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	0.005	ug	3/24/2006

TEI Number: 71458 Sample: 100

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	<0.3	ug	3/31/2006

TEI Number: 71459 Sample: 101

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	<0.1	ug	4/5/2006

TEI Number: 71460 Sample: 102

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	<0.3	ug	3/31/2006

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TEI Number: 71461 Sample: 103

TEST	**RESULTS**		**DATE PERFORMED**
Mercury (Ontario Method)	<0.3	ug	3/31/2006

TEI Number: 71462 Sample: 104

TEST	**RESULTS**		**DATE PERFORMED**
Mercury (Ontario Method)	<0.1	ug	4/5/2006

TEI Number: 71463 Sample: 105

TEST	**RESULTS**		**DATE PERFORMED**
Mercury (Ontario Method)	<0.3	ug	3/31/2006

TEI Number: 71464 Sample: 106

TEST	**RESULTS**		**DATE PERFORMED**
Mercury (Ontario Method)	<0.3	ug	3/31/2006

TEI Number: 71465 Sample: 107

TEST	**RESULTS**		**DATE PERFORMED**
Mercury (Ontario Method)	<0.1	ug	4/5/2006

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TEI Number: 71466 Sample: 108

TEST	RESULTS		DATE PERFORMED
Mercury (Ontario Method)	<0.3	ug	3/31/2006

TEI Number: 71467 Sample: 109

TEST	RESULTS		DATE PERFORMED
Bromine (M26A)	<0.2	mg	3/24/2006
Chlorine (M26A)	<0.1	mg	3/24/2006

TEI Number: 71468 Sample: 110

TEST	RESULTS		DATE PERFORMED
HBr (M26A)	<0.2	mg	3/24/2006
HCl (M26A)	<0.1	mg	3/24/2006
HF (M26A)	<0.1	mg	3/24/2006

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Project/Project Number: ADA-AEP Conesville

Date: 3/19/06 **Analyst:** S. Ehlers

Description	Initial Weight	Final Weight	Net Weight Gain
Test No. 1			
Filter No. 149/ ~~1?~~ 172	0.3196/0.2799	0.3213/0.2862	0.0080
Acetone Wash No. 135 35 ml	5.1820	5.1856	0.0036
Acetone Blank			0.0000
Total Weight			0.0116
Test No. 2			
Filter No. 171	0.2850	0.2936	0.0086
Acetone Wash No. 136 30 ml	5.1806	5.1836	0.0030
Acetone Blank			0.0000
Total Weight			0.0116
Test No. 3			
Filter No. 184	0.3459	0.3549	0.0090
Acetone Wash No. 137 45 ml	5.1157	5.1202	0.0045
Acetone Blank			0.0000
Total Weight			0.0135
Test No. 4			
Filter No. 183	0.3500	0.3661	0.0161
Acetone Wash No. 138 40 ml	5.1368	5.1423	0.0055
Acetone Blank			0.0000
Total Weight			0.0216
Blank			
Acetone Wash No. ml			

Project/Project Number: ADA-AEP Conesville

Date: 3/19/06 **Analyst:** G Ehler

Description		Initial Weight	Final Weight	Net Weight Gain
Test No.				
Filter No. 009		1.9764	9.2903	7.3139
Acetone Wash No.	ml			
Acetone Blank				
Total Weight				
Test No. 3				
Filter No. 010		3.0273	10.3803	7.3530
Acetone Wash No.	ml			
Acetone Blank				
Total Weight				
Test No. 4				
Filter No. 002		2.1539	7.2236	5.0697
Acetone Wash No.	ml			
Acetone Blank				
Total Weight				
Test No.				
Filter No.				
Acetone Wash No.	ml			
Acetone Blank				
Total Weight				
Blank				
Acetone Wash No.	ml			

NOMENCLATURE - PARTICULATES

A = Cross-sectional area of stack or duct, ft^2
A_n = Cross-sectional area of nozzle, ft^2
B_{ws} = Water vapor in gas stream, proportion by volume
C_a = Acetone blank residue concentration, g/g
C_{acf} = Concentration of particulate matter in gas stream at actual conditions, gr/acf
C_p = Pitot tube coefficient, dimensionless
C_s = Concentration of particulate matter in gas stream, dry basis, corrected to standard conditions, gr/dscf
IKV = Isokinetic sampling variance, must be $.90 \leq IKV \leq 1.10$
M_d = Dry molecular weight of gas, lb/lb-mole
m_n = Total amount of particulate matter collected, grams
M_s = Molecular weight of gas, wet basis, lb/lb-mole
M_w = Molecular weight of water, 18.0 lb/lb-mole
m_a = Mass of residue of acetone after evaporation, grams
P_{bar} = Barometric pressure at testing site, in. Hg
P_g = Static pressure of gas, in. Hg (in. H_2O/13.6)
P_s = Absolute pressure of gas, in. Hg = $P_{bar} + P_g$
P_{std} = Standard absolute pressure, 29.92 in. Hg
Q_{acfm} = Actual volumetric gas flow rate, acfm
Q_{sd} = Dry volumetric gas flow rate corrected to standard conditions, dscf/hr
R = Ideal gas constant, 21.85 in. Hg-ft^3/°R-lb-mole
T_m = Absolute dry gas meter temperature, °R
T_s = Absolute gas temperature, °R
T_{std} = Standard absolute temperature, 528°R
V_a = Volume of acetone blank, ml
V_{aw} = Volume of acetone used in wash, ml
V_{1c} = Total volume of liquid collected in impingers and silica gel, ml
V_m = Volume of gas sample as measured by dry gas meter, dcf
$V_{m(std)}$ = Volume of gas sample measured by dry gas meter, corrected to standard conditions, dscf
v_s = Gas velocity, ft/sec
$V_{w(std)}$ = Volume of water vapor in gas sample, corrected to standard conditions, scf
W_a = Weight of residue in acetone wash, grams
Y = Dry gas meter calibration factor
ΔH = Average pressure differential across the orifice meter, in. H_2O
Δp = Velocity head of gas, in. H_2O
ρ_a = Density of acetone, 0.7855 g/ml (average)
ρ_w = Density of water, 0.002201 lb/ml
θ = Total sampling time, minutes
K_1 = 17.64 °R/in. Hg
K_2 = 0.04707 ft^3/ml
K_4 = 0.09450/100 = 0.000945
K_p = Pitot tube constant, $85.49 \frac{ft}{sec}\left[\frac{(lb/lb-mole)(in.Hg)}{(°R)(in.H_2O)}\right]^{1/2}$
%EA = Percent excess air
$\%CO_2$ = Percent carbon dioxide by volume, dry basis
$\%O_2$ = Percent oxygen by volume, dry basis
%CO = Percent carbon monoxide by volume, dry basis
$\%N_2$ = Percent nitrogen by volume, dry basis
0.264 = Ratio of O_2 to N_2 in air, v/v
0.28 = Molecular weight of N_2 or CO, divided by 100
0.32 = Molecular weight of O_2 divided by 100
0.44 = Molecular weight of CO_2 divided by 100
13.6 = Specific gravity of mercury (Hg)

CALCULATION FORMULAS PARTICULATES

1. $$V_{m(std)} = V_m Y \left(\frac{T_{std}}{T_m}\right)\left(\frac{P_{bar} + \frac{\Delta H}{13.6}}{P_{std}}\right) = K_1\, V_m\, Y\, \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m}$$

2. $$V_{w(std)} = V_{lc}\left(\frac{\rho_w}{M_w}\right)\left(\frac{RT_{std}}{P_{std}}\right) = K_2 V_{lc}$$

3. $$B_{ws} = \frac{V_{w(std)}}{V_{m(std)} + V_{w(std)}}$$

4a. $$C_a = \frac{m_a}{V_a \rho_a}$$

4b. $$W_a = C_a V_{aw} \rho_a$$

5. $$C_S = (15.43 \text{ grains/gram})\,(m_n / V_{m(std)})$$

6. $$C_{acf} = 15.43 K_i \left(\frac{m_n P_s}{V_{w(std)} + V_{m(std)}\; T_s}\right)$$

7. $$\%EA = \left(\frac{\%O_2 - (0.5\ \%CO}{0.264\ \%N_2 - (\%O_2 - 0.5\ \%CO}\right) \times 100$$

8. $$M_d = 0.44(\%CO_2) + 0.32(\%O_2) + 0.28(\%N_2)$$

9. $$M_s = M_d(1 - B_{ws}) + 18.0 B_{ws}$$

10. $$v_s = K_p C_p \sqrt{\frac{\Delta P\ T_s}{P_s M_s}}$$

11. $$Q_{acfm} = v_s A (60_{sec/min})$$

12. $$Q_{sd} = (3600_{sec/hr})(1 - B_{ws})\ v_s \left(\frac{T_{std} P_s}{T_s P_{std}}\right) A$$

13. $$E \text{ (emission rate, lbs/hr)} = Q_{std}(C_s / 7000 \text{ grains/lb})$$

14. $$IKV = \frac{T_s V_{m(std)} P_{std}}{T_{std} v_s \theta A_n P_s 60 (1 - B_{ws})} = K_4 \frac{T_s V_{m(std)}}{P_s v_s A_n \theta (1 - B_{ws})}$$

EMISSION RATE CALCULATIONS

A pollutant emission rate (E), expressed as pounds of pollutant per million Btu heat input from the fuel combusted can be calculated by several methods as follows:

1. $C = C_s/7000$ where, C = pollutant concentration, lb/dscf
   c_s = pollutant concentration, grains/dscf

2. If fuel flow is monitored and the fuel combusted during the test is sampled and analyzed for gross calorific value, then:

$$E = \frac{Q_{sd} C}{\text{fuel flow rate (lb / hr) GCV}} \times 10^6$$

where, E = lbs per million Btu
GCV = gross calorific value, Btu / lb
Q_{sd} = dry volumetric gas flow at standard conditions, dscf / hr

3. If an integrated gas sample is taken during the test and analyzed for $\%CO_2$ or $\%O_2$, dry basis by volume, with an Orsat gas analyzer, then

$$E = C F_c \frac{100}{(\%CO_2)} \text{ or, } E = C F \frac{20.9}{(20.9 - \%O_2)} \quad \text{where,}$$

$\%CO_2$ and $\%O_2$ are expressed as percent; and, for example, for subbituminous and bituminous coals:

F_c = a factor representing a ratio of the volume of carbon dioxide generated to the calorific value of the fuel combusted, 1800 scf CO_2/million Btu.

F = a factor representing a ratio of the volume of dry flue gases generated to the calorific value of the fuel combusted, 9780 dscf/million Btu.

4. If fuel sample increments are taken and composited during the test and an ultimate analysis is performed and the GCV is determined, then

$$F_c = \frac{321 \times 10^3 (\%C)}{GCV} \quad \text{where, } \%C = \text{carbon content by weight expressed as percent}$$

$$F = \frac{[3.64\,(\%H) + 1.53\,(\%C) + 0.57\,(\%S) + 0.14\,(\%N) - 0.46\,(\%O_2)]}{GVC} \times 10^6$$

where, H, C, S, N, and O are content by weight of hydrogen, carbon, sulfur, nitrogen, and oxygen (expressed as percent) respectively.

5. If fuels other than subbituminous and bituminous coals are fired, other F-factors than those above will apply; and, if combinations of different fuels are fired, the F-factors must be prorated according to the fraction of the total heat input derived from each type of fuel.

MERCURY SAMPLE CALCULATION

Concentration

$$\frac{\mu g}{m^3} = \frac{\mu g \text{ of sample}}{\text{dscf volume sampled} \times 0.02832 \ \frac{m^3}{ft^3}}$$

Emission Rate

$$\frac{\mu g \text{ of sample} \times \frac{1 \times 10^{-6} \text{ grams}}{\mu g}}{453.6 \text{ gr/lb}} = \text{lbs of sample}$$

$$\frac{\text{lbs/sample}}{\text{Vm (std) sample}} \times \text{dscfm} \times 60 \ \frac{\text{min}}{\text{hr}} = \text{lbs/hr}$$

CALCULATIONS FOR HYDROGEN CHLORIDE (HCl)

Concentration of Hydrogen Chloride:

$$\frac{\text{lbs HCl}}{\text{dscf}} = \frac{\mu\text{g HCl in sample}}{4.536 \times 10^{8} \times \text{dscf}}$$

where:

$4.536 \times 10^{8} = \mu g/lb$

dscf = Volume of gas sampled

$$\mu g/\text{lb HCl} = \mu g\ \text{Cl} \times \frac{36.453}{35.453}$$

Parts Per Million v/v- Hydrogen Chloride

$$\text{ppm HCl} = \frac{\text{lbs HCl}}{\text{dscf}} \div \frac{36.453}{385 \times 10^{6}}$$

where:

385 = Volume of 1 lb mole of gas at 68F and 29.92 in. Hg

10^{6} = Conversion of ppm v/v

Example Calculations - Method 5/26A Test

Company: ADA
Plant: AEP Conesville
Test Location: Unit 6 ESP Outlet
Run: 1
Date: 3/14/2006

Dry Molecular Weight

$$Md = 0.44 \times (\%CO_2) + 0.32 \times (\%O_2) + 0.28 \times \%N_2$$

$\%CO_2$ = 12.0 $\%O_2$ = 7.0 $\%N_2$ = 81.0

Md = 30.20

Wet Molecular Weight

$$Ms = Md \times (1-Bws) + (18.0 \times Bws)$$

Md = 30.20 Bws = 0.000

Ms = 29.55

Meter Volume at Standard Conditions

$$Vm(std) = 17.647 \times Y \times Vm \times \frac{(Pbar + \Delta H/13.6)}{Tm}$$

Y = 0.996 Vm = 43.911 Pbar = 28.90
ΔH = 1.35 Tm = 514.0

Vm(std) = 43.544

Volume of Water Vapor Condensed

$$Vw(std) = 0.0471 \times (\text{net } H_2O \text{ gain})$$

Net H_2O = 52.4

Vw(std) = 2.468

Moisture Content

$$Bws = \frac{Vwc(std)}{Vwc(std) + Vm(std)}$$

Vw(std) = 2.468 Vm(std) = 43.544

Bws = 0.054 **Maximum Moisture Content = 0.000**

Average Duct Velocity

$$Vs = 85.49 \times Cp \times \text{Sqrt } \Delta P\ (avg) \times (Ts\ (avg)/ (Ps \times Ms))^{1/2}$$

Cp = 0.840 Ts (avg) = 788.6 Sqrt ΔP (avg): 0.509
Ps = 28.16 Ms = 29.55

Vs = 35.60

Example Calculations - Method 5/26A Test

Volumetric Flow Rate (Actual Basis)

$$Q = Vs \times A \times 60$$

Vs = 35.60 A = 600.000

Q = 1281445

Volumetric Flow Rate (Standard Basis)

$$Qstd = 17.647 \times Q \times \frac{Ps}{Ts\ (avg)}$$

Q = 1281445 Ps = 28.16 Ts (avg) = 788.6

Qstd = 807617

Volumetric Flow Rate (Standard Dry Basis)

$$Qstd(dry) = Qstd \times (1\text{-}Bws)$$

Qstd = 807617 Bws = 0.000

Qstd(dry) = 764298

Isokinetic Variation:

$$\%ISO = \frac{0.0945 \times Ts \times Vm(std)}{Vs \times \theta \times An \times Ps \times (1\text{-}Bws)}$$

Ts = 788.6 Vm(std) = 2.468 Vs = 35.596
An = 0.001 θ = 60.0 Ps = 28.16
Bws = 0.000

%ISO = 97.7

PM Concentration:

This example represents the filterable fraction. For other fractions, use the obtained m_n for that particulate fraction.

$$Co = \frac{m_n \times 15.43}{Vm(std)}$$

m_n (g) = 0.0116 Vm(std) = 43.544

Co = 0.0041 gr/dscf

PM Emission Rate:

$$ER\ lb/hr = \frac{Co}{7000} \times Qstd(dry) \times 60$$

$$ER\ lb/mmBtu = \frac{Co}{7000} \times Fd\ (dscf/mmBtu) \times \frac{20.9}{20.9 - O2\%}$$

Co = 0.0041 Qstd(dry) = 764298

ER lb/hr = 26.928 lb/hr

ER lb/mmBtu = 0.017 lb/mmBtu

Example Calculations - Method 17/26A Test

Company: ADA
Plant: AEP Conesville
Test Location: Unit 6 ESP Inlet
Run: 1
Date: 3/14/2006

Dry Molecular Weight

$Md = 0.44 \times (\%CO_2) + 0.32 \times (\%O_2) + 0.28 \times \%N_2$

$\%CO_2 =$ 13.0 $\%O_2 =$ 6.0 $\%N_2 =$ 81.0

Md = 30.32

Wet Molecular Weight

$Ms = Md \times (1\text{-}Bws) + (18.0 \times Bws)$

Md = 30.32 Bws = 0.000

Ms = 29.69

Meter Volume at Standard Conditions

$$Vm(std) = 17.647 \times Y \times Vm \times \frac{(Pbar + \Delta H/13.6)}{Tm}$$

Y = 1.006 Vm = 45.807 Pbar = 28.90
ΔH = 1.49 Tm = 521.3

Vm(std) = 45.258

Volume of Water Vapor Condensed

$Vw(std) = 0.0471 \times (\text{net } H_2O \text{ gain})$

Net H_2O = 51.6

Vw(std) = 2.430

Moisture Content

$$Bws = \frac{Vwc(std)}{Vwc(std) + Vm(std)}$$

Vw(std) = 2.430 Vm(std) = 45.258

Bws = 0.051 **Maximum Moisture Content = 0.000**

Average Duct Velocity

$Vs = 85.49 \times Cp \times \text{Sqrt } \Delta P \text{ (avg)} \times (Ts \text{ (avg)}/ (Ps \times Ms))^{1/2}$

Cp = 0.840 Ts (avg) = 789.6 Sqrt ΔP (avg): 0.557
Ps = 28.02 Ms = 29.69

Vs = 38.99

Example Calculations - Method 17/26A Test

Volumetric Flow Rate (Actual Basis)

$$Q = Vs \times A \times 60$$

Vs = 38.99 A = 772.125

Q = 1806379

Volumetric Flow Rate (Standard Basis)

$$Qstd = 17.647 \times Q \times \frac{Ps}{Ts\ (avg)}$$

Q = 1806379 Ps = 28.02 Ts (avg) = 789.6

Qstd = 1131133

Volumetric Flow Rate (Standard Dry Basis)

$$Qstd(dry) = Qstd \times (1\text{-}Bws)$$

Qstd = 1131133 Bws = 0.000

Qstd(dry) = 1073487

Isokinetic Variation:

$$\%ISO = \frac{0.0945 \times Ts \times Vm(std)}{Vs \times \theta \times An \times Ps \times (1\text{-}Bws)}$$

Ts = 789.6 Vm(std) = 2.430 Vs = 38.992
An = 0.001 θ = 60.0 Ps = 28.02
Bws = 0.000

%ISO = 98.4

PM Concentration:

This example represents the filterable fraction. For other fractions, use the obtained m_n for that particulate fraction.

$$Co = \frac{m_n \times 15.43}{Vm(std)}$$

m_n (g) = 7.3139 Vm(std) = 45.258

Co = 2.4935 gr/dscf

PM Emission Rate:

$$ER\ lb/hr = \frac{Co}{7000} \times Qstd(dry) \times 60$$

$$ER\ lb/mmBtu = \frac{Co}{7000} \times Fd\ (dscf/mmBtu) \times \frac{20.9}{20.9 - O2\%}$$

Co = 2.4935 Qstd(dry) = 1073487

ER lb/hr = 22943.895 lb/hr

ER lb/mmBtu = 4.887 lb/hr

VOLUMETRIC AIR FLOW CALCULATIONS

$$Vm\ (std) = 17.647 \times Vm \times \left[\frac{P_{bar} + \frac{DH}{13.6}}{(460 + Tm)} \right] \times Y$$

$$Vw\ (std) = 0.0471 \times Vlc$$

Vlc = water + silica net

$$Bws = \left[\frac{Vw\ (std)}{Vw\ (std) + Vm\ (std)} \right]$$

$$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + [0.28 \times (100 - \%CO_2 - \%O_2)]$$

$$MS = Md \times (1 - Bws) + (18 \times Bws)$$

$$Vs = \sqrt{\frac{(Ts + 460)}{Ms \times Ps}} \times \sqrt{DP} \times Cp \times 85.49$$

Cp = pitot tube correction factor
Ps = absolute flue gas pressure
Ms = molecular weight of gas (lb/lb mole)
Md = dry molecular weight of gas (lb/lb mole)
Bws = water vapor in gas stream proportion by volume

$$Acfm = Vs \times Area\ (of\ stack\ or\ duct) \times 60$$

$$Dscfm = Acfm \times 17.647 \times \left[\frac{Ps}{(460 + Ts)} \right] \times (1 - Bws)$$

$$Scfm = Acfm \times 17.647 \times \left[\frac{Ps}{(460 + Ts)} \right]$$

$$Scfh = Scfm \times 60 \frac{min}{hr}$$

TEST DATA	- Ontario Hydro	Run No.: 2

Project Number: PE2006043 **Test Date:** 3/16/2006

TEST PARAMETERS

Company:	ADA		**Duct Shape:**	Rectangular	
Plant:	AEP Conesville		**Length:**	17.75	**Feet**
Test Location:	Unit 6 ESP Inlet		**Width:**	43.50	**Feet**
Source Condition:	Normal		**Duct Area:**	772.125	**Sq. Ft.**
Test Engineer:	CT				
Temp ID:	CM-7		**Sample Plane:**	Horizontal	
Meter ID:	CM-7		**Port Length:**	18.00	**in.**
Meter Calibration Factor:	1.006		**Port Size (diameter):**	4.00	**in.**
Pitot ID:			**Port Type:**	Flange	
Pitot Tube Coefficient:	0.840		**Number of Ports Sampled:**	6	
Probe Length:	10.0	**ft.**	**Number of Points per Port:**	2	
Probe Liner Material:	Teflon		**Minutes per Point:**	10.0	
Nozzle Diameter:	0.268	**in.**	**Total Number of Traverse Points:**	12	
Train Type:	Other		**Test Length:**	120	**min.**

STACK CONDITIONS / MOISTURE DETERMINATION

Barometric Pressure (Pb):	29.00	**in. Hg.**	**Initial Impinger Content:**	5995.00	**mls.**
Static Pressure:	-12.00	**in. H_2O**	**Final Impinger Content:**	6103.00	**mls.**
Flue Pressure (Ps):	28.12	**in. Hg. abs.**	**Difference:**	108.00	
Sample Train Leak Check Pre:	0.000		**Silica Initial Wt.**	0.00	**grams**
Post:	0.000		**Silica Final Wt.**	0.00	**grams**
@	10/10	**in. Hg.**	**Difference:**	0.00	
Carbon Dioxide:	13.0	**%**	**Total Water Gain:**	108.00	
Oxygen:	6.0	**%**			
Nitrogen:	81.0	**%**			

STACK PARAMETERS

Delta H:	0.76	**Inches H_2O**	**Gas Weight dry, Md:**	30.320	**lb/lb mole**
Meter Temperature, Tm:	79.0	**°F**	**Gas Weight wet, Ms:**	29.398	**lb/lb mole**
Sqrt ΔP:	0.547	**Inches H_2O**	**Excess Air:**	39.002	**%**
Stack Temperature, Ts:	333.3	**°F**	**Gas Velocity, Vs:**	38.497	
Meter Volume, Vm:	65.691	**Cubic Feet**	**Volumetric Flow, ACFM:**	1,783,456	
Meter Volume, Vmstd:	62.866	**dscf**	**Volumetric Flow, DSCFM:**	1,031,966	
Meter Volume, Vwstd:	5.087	**wscf**	**Volumetric Flow, SCFM:**	1,115,467	
Moisture, Bws:	0.075		**Isokinetic Variance, %I:**	100.1	
Meter Volume, Normal	58.581				

EMISSION DATA

Type of Fuel Firing:	Coal
Fuel Factor F_d (dscf/mmBtu):	9780
List Mol. Wt. of Analyte if ppm needed:	200.590

Speciated Mercury

Particle Bound Mercury	
mg (net) collected:	0.000180
ppb:	0.012115
ug/dncm:	0.11
lb/hr:	0.000391
lb/mmBtu (based on Fd):	0.00000009
Elemental Mercury	
mg (net) collected:	0.00883
ppb:	0.594325
ug/dncm:	5.32
lb/hr:	0.019173
lb/mmBtu (based on Fd):	0.00000425
Oxidized Mercury	
mg (net) collected:	0.01770
ppb:	1.191342
ug/dncm:	10.67
lb/hr:	0.038433
lb/mmBtu (based on Fd):	0.00000852
Total Mercury	
mg (net) collected:	0.02671
ppb:	1.797782
ug/dncm:	16.10
lb/hr:	0.057997
lb/mmBtu (based on Fd):	0.00001285

TRAVERSE DATA: Ontario Hydro

Company: ADA
Plant: AEP Conesville
Location: Unit 6 ESP Inlet

Test Run: 2 **Test Date:** 3/16/2006
Start Time: 8:55
End Time: 11:00

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	8:55:00	0.24	0.60	41.89	0.490	362	77	77	5.0	4.899	35.08
1-2	9:05:00	0.35	0.88	46.79	0.592	366	77	77	5.0	5.920	42.47
	9:15:00			52.71							
2-1	9:16:00	0.24	0.60	52.77	0.490	355	78	77	5.0	4.900	34.93
2-2	9:26:00	0.30	0.76	57.67	0.548	362	78	78	5.0	5.480	39.22
	9:36:00			63.15							
3-1	9:37:00	0.31	0.78	63.21	0.557	330	79	78	5.0	5.540	39.09
3-2	9:47:00	0.30	0.76	68.75	0.548	333	79	78	5.0	5.510	38.53
	9:57:00			74.26							
4-1	9:58:00	0.31	0.78	74.33	0.557	329	80	79	5.0	5.570	39.06
4-2	10:08:00	0.29	0.74	79.90	0.539	332	80	79	5.0	5.390	37.85
	10:18:00			85.29							
5-1	10:19:00	0.27	0.68	85.36	0.520	314	81	79	5.0	5.200	36.11
5-2	10:29:00	0.37	0.93	90.56	0.608	310	81	80	5.0	6.080	42.16
	10:39:00			96.64							
6-1	10:40:00	0.27	0.68	96.71	0.520	300	82	80	5.0	5.200	35.78
6-2	10:50:00	0.36	0.91	101.91	0.600	307	82	80	5.0	6.002	41.50
	11:00:00			107.91							
			0.76	65.691	0.547	333	80	79		65.691	
							79.00				

Field Notes/Comments:

TEST DATA	- Ontario Hydro	Run No.: 3

Project Number: PE2006043 **Test Date:** 3/16/2006

TEST PARAMETERS

Company:	ADA		**Duct Shape:**	Rectangular	
Plant:	AEP Conesville		**Length:**	17.75	**Feet**
Test Location:	Unit 6 ESP Inlet		**Width:**	43.50	**Feet**
Source Condition:	Normal		**Duct Area:**	772.125	**Sq. Ft.**
Test Engineer:	CT				
Temp ID:	CM-7		**Sample Plane:**	Horizontal	
Meter ID:	CM-7		**Port Length:**	18.00	**in.**
Meter Calibration Factor:	1.006		**Port Size (diameter):**	4.00	**in.**
Pitot ID:			**Port Type:**	Flange	
Pitot Tube Coefficient:	0.840		**Number of Ports Sampled:**	6	
Probe Length:	10.0	**ft.**	**Number of Points per Port:**	2	
Probe Liner Material:	Teflon		**Minutes per Point:**	10.0	
Nozzle Diameter:	0.268	**in.**	**Total Number of Traverse Points:**	12	
Train Type:	Other		**Test Length:**	120	**min.**

STACK CONDITIONS / **MOISTURE DETERMINATION**

Barometric Pressure (Pb):	29.00	**in. Hg.**	**Initial Impinger Content:**	6155.40	**mls.**
Static Pressure:	-12.00	**in. H_2O**	**Final Impinger Content:**	6260.00	**mls.**
Flue Pressure (Ps):	28.12	**in. Hg. abs.**	**Difference:**	104.60	
Sample Train Pre:	0.000		**Silica Initial Wt.**	0.00	**grams**
Leak Check Post:	0.000		**Silica Final Wt.**	0.00	**grams**
@	10/10	**in. Hg.**	**Difference:**	0.00	
Carbon Dioxide:	13.0	**%**	**Total Water Gain:**	104.60	
Oxygen:	6.0	**%**			
Nitrogen:	81.0	**%**			

STACK PARAMETERS

Delta H:	0.77	**Inches H_2O**	**Gas Weight dry, Md:**	30.320	**lb/lb mole**
Meter Temperature, Tm:	80.0	**°F**	**Gas Weight wet, Ms:**	29.428	**lb/lb mole**
Sqrt ΔP:	0.550	**Inches H_2O**	**Excess Air:**	39.002	**%**
Stack Temperature, Ts:	332.9	**°F**	**Gas Velocity, Vs:**	38.680	
Meter Volume, Vm:	66.042	**Cubic Feet**	**Volumetric Flow, ACFM:**	1,791,928	
Meter Volume, Vmstd:	63.087	**dscf**	**Volumetric Flow, DSCFM:**	1,040,127	
Meter Volume, Vwstd:	4.927	**wscf**	**Volumetric Flow, SCFM:**	1,121,354	
Moisture, Bws:	0.072		**Isokinetic Variance, %I:**	99.7	
Meter Volume, Normal	58.786				

EMISSION DATA

Type of Fuel Firing:	Coal
Fuel Factor F_d (dscf/mmBtu):	9780
List Mol. Wt. of Analyte if ppm needed:	200.590

Speciated Mercury

Particle Bound Mercury	
mg (net) collected:	0.000120
ppb:	0.008049
ug/dncm:	0.07
lb/hr:	0.000262
lb/mmBtu (based on Fd):	0.00000006
Elemental Mercury	
mg (net) collected:	0.00852
ppb:	0.571457
ug/dncm:	5.12
lb/hr:	0.018581
lb/mmBtu (based on Fd):	0.00000408
Oxidized Mercury	
mg (net) collected:	0.01970
ppb:	1.321326
ug/dncm:	11.83
lb/hr:	0.042964
lb/mmBtu (based on Fd):	0.00000944
Total Mercury	
mg (net) collected:	0.02834
ppb:	1.900831
ug/dncm:	17.02
lb/hr:	0.061806
lb/mmBtu (based on Fd):	0.00001359

TRAVERSE DATA: Ontario Hydro

Company: ADA
Plant: AEP Conesville
Location: Unit 6 ESP Inlet

Test Run: 3
Start Time: 11:30
End Time: 13:35
Test Date: 3/16/2006

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	11:30:00	0.25	0.63	8.38	0.500	363	78	78	5.0	4.999	35.83
1-2	11:40:00	0.35	0.88	13.38	0.592	365	78	78	5.0	5.920	42.44
	11:50:00			19.30							
2-1	11:51:00	0.27	0.68	19.36	0.520	351	79	78	5.0	5.200	36.96
2-2	12:01:00	0.34	0.86	24.56	0.583	361	79	79	5.0	5.830	41.73
	12:11:00			30.39							
3-1	12:12:00	0.31	0.78	30.46	0.557	332	80	79	5.0	5.570	39.14
3-2	12:22:00	0.28	0.71	36.03	0.529	331	80	79	5.0	5.290	37.17
	12:32:00			41.32							
4-1	12:33:00	0.31	0.78	41.38	0.557	330	81	80	5.0	5.570	39.09
4-2	12:43:00	0.30	0.76	46.95	0.548	329	81	80	5.0	5.480	38.43
	12:53:00			52.43							
5-1	12:54:00	0.26	0.66	52.50	0.510	317	82	80	5.0	5.100	35.50
5-2	13:04:00	0.38	0.96	57.60	0.616	311	82	81	5.0	6.160	42.75
	13:14:00			63.76							
6-1	13:15:00	0.25	0.63	63.82	0.500	300	83	81	5.0	5.000	34.43
6-2	13:25:00	0.35	0.88	68.82	0.592	305	83	81	5.0	5.923	40.87
	13:35:00			74.74							
			0.77	66.042	0.550	333	81	80		66.042	
							80.00				

Field Notes/Comments:

TEST DATA	- Ontario Hydro	Run No.: 4

Project Number: PE2006043 **Test Date:** 3/17/2006

TEST PARAMETERS

Company:	ADA	
Plant:	AEP Conesville	
Test Location:	Unit 6 ESP Inlet	
Source Condition:	Normal	
Test Engineer:	CT	
Temp ID:	CM-7	
Meter ID:	CM-7	
Meter Calibration Factor:	1.006	
Pitot ID:		
Pitot Tube Coefficient:	0.840	
Probe Length:	10.0	**ft.**
Probe Liner Material:	Teflon	
Nozzle Diameter:	0.268	**in.**
Train Type:	Other	

Duct Shape:	Rectangular	
Length:	17.75	**Feet**
Width:	43.50	**Feet**
Duct Area:	772.125	**Sq. Ft.**
Sample Plane:	Horizontal	
Port Length:	18.00	**in.**
Port Size (diameter):	4.00	**in.**
Port Type:	Flange	
Number of Ports Sampled:	6	
Number of Points per Port:	2	
Minutes per Point:	10.0	
Total Number of Traverse Points:	12	
Test Length:	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	29.23	**in. Hg.**
Static Pressure:	-12.00	**in. H_2O**
Flue Pressure (Ps):	28.35	**in. Hg. abs.**
Sample Train Leak Check Pre:	0.000	
Post:	0.000	
@	10/10	**in. Hg.**
Carbon Dioxide:	13.0	**%**
Oxygen:	6.0	**%**
Nitrogen:	81.0	**%**

MOISTURE DETERMINATION

Initial Impinger Content:	6137.00	**mls.**
Final Impinger Content:	6234.20	**mls.**
Difference:	97.20	
Silica Initial Wt.	0.00	**grams**
Silica Final Wt.	0.00	**grams**
Difference:	0.00	
Total Water Gain:	97.20	

STACK PARAMETERS

Delta H:	0.78	**Inches H_2O**
Meter Temperature, Tm:	78.0	**°F**
Sqrt ΔP:	0.556	**Inches H_2O**
Stack Temperature, Ts:	332.9	**°F**
Meter Volume, Vm:	66.754	**Cubic Feet**
Meter Volume, Vmstd:	64.512	**dscf**
Meter Volume, Vwstd:	4.578	**wscf**
Moisture, Bws:	0.066	
Meter Volume, Normal	60.114	

Gas Weight dry, Md:	30.320	**lb/lb mole**
Gas Weight wet, Ms:	29.504	**lb/lb mole**
Excess Air:	39.002	**%**
Gas Velocity, Vs:	38.888	
Volumetric Flow, ACFM:	1,801,562	
Volumetric Flow, DSCFM:	1,061,291	
Volumetric Flow, SCFM:	1,136,605	
Isokinetic Variance, %I:	99.9	

EMISSION DATA

Type of Fuel Firing:	Coal
Fuel Factor F_d (dscf/mmBtu):	9780
List Mol. Wt. of Analyte if ppm needed:	200.590

Speciated Mercury

Particle Bound Mercury	
mg (net) collected:	0.002010
ppb:	0.131836
ug/dncm:	1.18
lb/hr:	0.004374
lb/mmBtu (based on Fd):	0.00000094
Elemental Mercury	
mg (net) collected:	0.00712
ppb:	0.467002
ug/dncm:	4.18
lb/hr:	0.015494
lb/mmBtu (based on Fd):	0.00000334
Oxidized Mercury	
mg (net) collected:	0.06050
ppb:	3.968208
ug/dncm:	35.54
lb/hr:	0.131654
lb/mmBtu (based on Fd):	0.00002836
Total Mercury	
mg (net) collected:	0.06963
ppb:	4.567047
ug/dncm:	40.90
lb/hr:	0.151521
lb/mmBtu (based on Fd):	0.00003264

TRAVERSE DATA: Ontario Hydro

Company: ADA
Plant: AEP Conesville
Location: Unit 6 ESP Inlet

Test Run: 4
Start Time: 8:05
End Time: 10:10
Test Date: 3/17/2006

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	8:05:00	0.28	0.71	43.32	0.529	363	76	76	5.0	5.290	37.92
1-2	8:15:00	0.34	0.86	48.61	0.583	367	76	76	5.0	5.830	41.88
	8:25:00			54.44							
2-1	8:26:00	0.28	0.71	54.50	0.529	358	77	76	5.0	5.300	37.80
2-2	8:36:00	0.32	0.81	59.80	0.566	361	77	77	5.0	5.650	40.49
	8:46:00			65.45							
3-1	8:47:00	0.31	0.78	65.52	0.557	331	78	77	5.0	5.560	39.11
3-2	8:57:00	0.31	0.78	71.08	0.557	330	78	77	5.0	5.580	39.09
	9:07:00			76.66							
4-1	9:08:00	0.30	0.70	76.73	0.548	328	79	78	5.0	5.480	38.40
4-2	9:18:00	0.31	0.78	82.21	0.557	330	79	78	5.0	5.570	39.09
	9:28:00			87.78							
5-1	9:29:00	0.27	0.68	87.85	0.520	310	80	78	5.0	5.200	36.01
5-2	9:39:00	0.36	0.91	93.05	0.600	312	80	79	5.0	6.000	41.64
	9:49:00			99.05							
6-1	9:50:00	0.28	0.71	99.13	0.529	300	81	79	5.0	5.290	36.44
6-2	10:00:00	0.36	0.91	104.42	0.600	305	81	79	5.0	6.004	41.45
	10:10:00			110.42							
			0.78	66.754	0.556	333	79	78		66.754	
							78.00				

Field Notes/Comments:

TEST DATA	- Ontario Hydro	Run No.: 5

Project Number: PE2006043 **Test Date:** 3/17/2006

TEST PARAMETERS

Company:	ADA		**Duct Shape:**	Rectangular	
Plant:	AEP Conesville		**Length:**	17.75	**Feet**
Test Location:	Unit 6 ESP Inlet		**Width:**	43.50	**Feet**
Source Condition:	Normal		**Duct Area:**	772.125	**Sq. Ft.**
Test Engineer:	CT				
Temp ID:	CM-7		**Sample Plane:**	Horizontal	
Meter ID:	CM-7		**Port Length:**	18.00	**in.**
Meter Calibration Factor:	1.006		**Port Size (diameter):**	4.00	**in.**
Pitot ID:			**Port Type:**	Flange	
Pitot Tube Coefficient:	0.840		**Number of Ports Sampled:**	6	
Probe Length:	10.0	**ft.**	**Number of Points per Port:**	2	
Probe Liner Material:	Teflon		**Minutes per Point:**	7.0	
Nozzle Diameter:	0.268	**in.**	**Total Number of Traverse Points:**	12	
Train Type:	Other		**Test Length:**	84	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):		29.23	**in. Hg.**
Static Pressure:		-12.00	**in. H_2O**
Flue Pressure (Ps):		28.35	**in. Hg. abs.**
Sample Train	**Pre:**	0.000	
Leak Check	**Post:**	0.000	
	@	10/10	**in. Hg.**
Carbon Dioxide:		13.0	**%**
Oxygen:		6.0	**%**
Nitrogen:		81.0	**%**

MOISTURE DETERMINATION

Final Impinger Content:	6033.00	**mls.**
Initial Impinger Content:	5966.80	**mls.**
Difference:	66.20	
Silica Final Wt.	0.00	**grams**
Silica Initial Wt.	0.00	**grams**
Difference:	0.00	
Total Water Gain:	66.20	

STACK PARAMETERS

Delta H:	0.79	**Inches H_2O**	**Gas Weight dry, Md:**	30.320	**lb/lb mole**
Meter Temperature, Tm:	80.0	**°F**	**Gas Weight wet, Ms:**	29.523	**lb/lb mole**
Sqrt ΔP:	0.558	**Inches H_2O**	**Excess Air:**	39.002	**%**
Stack Temperature, Ts:	334.0	**°F**	**Gas Velocity, Vs:**	39.001	
Meter Volume, Vm:	46.829	**Cubic Feet**	**Volumetric Flow, ACFM:**	1,806,826	
Meter Volume, Vmstd:	45.090	**dscf**	**Volumetric Flow, DSCFM:**	1,064,743	
Meter Volume, Vwstd:	3.118	**wscf**	**Volumetric Flow, SCFM:**	1,138,371	
Moisture, Bws:	0.065		**Isokinetic Variance, %I:**	99.4	
Meter Volume, Normal	42.016				

EMISSION DATA

Type of Fuel Firing:	Coal
Fuel Factor F_d (dscf/mmBtu):	9780
List Mol. Wt. of Analyte if ppm needed:	200.590

Speciated Mercury

Particle Bound Mercury	
mg (net) collected:	0.005490
ppb:	0.515198
ug/dncm:	4.61
lb/hr:	0.017148
lb/mmBtu (based on Fd):	0.00000368
Elemental Mercury	
mg (net) collected:	0.00840
ppb:	0.788282
ug/dncm:	7.06
lb/hr:	0.026238
lb/mmBtu (based on Fd):	0.00000563
Oxidized Mercury	
mg (net) collected:	0.02610
ppb:	2.449303
ug/dncm:	21.94
lb/hr:	0.081525
lb/mmBtu (based on Fd):	0.00001751
Total Mercury	
mg (net) collected:	0.03999
ppb:	3.752783
ug/dncm:	33.61
lb/hr:	0.124912
lb/mmBtu (based on Fd):	0.00002682

TRAVERSE DATA: Ontario Hydro

Company: ADA
Plant: AEP Conesville
Location: Unit 6 ESP Inlet

Test Run: 5 **Test Date:** 3/16/2006
Start Time: 11:25
End Time: 12:54

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	11:25:00	0.26	0.66	11.07	0.510	364	78	78	5.0	3.574	36.56
1-2	11:32:00	0.33	0.83	14.64	0.574	368	78	78	5.0	4.020	41.29
	11:39:00			18.66							
2-1	11:40:00	0.28	0.71	18.73	0.529	358	79	78	5.0	3.700	37.80
2-2	11:47:00	0.33	0.83	22.43	0.574	364	79	79	5.0	4.020	41.19
	11:54:00			26.45							
3-1	11:55:00	0.32	0.81	26.52	0.566	330	80	79	5.0	3.960	39.71
3-2	12:02:00	0.32	0.81	30.48	0.566	332	80	79	5.0	3.960	39.76
	12:09:00			34.44							
4-1	12:10:00	0.30	0.76	34.51	0.548	331	81	80	5.0	3.830	38.48
4-2	12:17:00	0.32	0.81	38.34	0.566	330	81	80	5.0	3.960	39.71
	12:24:00			42.30							
5-1	12:25:00	0.28	0.71	42.37	0.529	315	82	80	5.0	3.700	36.79
5-2	12:32:00	0.36	0.91	46.07	0.600	310	82	81	5.0	4.200	41.59
	12:39:00			50.27							
6-1	12:40:00	0.28	0.71	50.34	0.529	299	83	81	5.0	3.700	36.41
6-2	12:47:00	0.36	0.91	54.04	0.600	307	83	81	5.0	4.205	41.50
	12:54:00			58.25							
			0.79	46.829	0.558	334	81	80		46.829	
							80.00				

Field Notes/Comments:

TEST DATA	- Ontario Hydro	Run No.: 2

Project Number:	PE2006043	Test Date:	3/16/2006

TEST PARAMETERS

Company:	ADA		**Duct Shape:**	Rectangular	
Plant:	AEP Conesville		**Length:**	15.00	**Feet**
Test Location:	Unit 6 ESP Outlet		**Width:**	40.00	**Feet**
Source Condition:	Normal		**Duct Area:**	600.000	**Sq. Ft.**
Test Engineer:	JLH				
Temp ID:	CM-9		**Sample Plane:**	Vertical	
Meter ID:	CM-9		**Port Length:**		**in.**
Meter Calibration Factor:	0.996		**Port Size (diameter):**	4.00	**in.**
Pitot ID:	005A		**Port Type:**	Flange	
Pitot Tube Coefficient:	0.840		**Number of Ports Sampled:**	1	
Probe Length:	10.0	**ft.**	**Number of Points per Port:**	1	
Probe Liner Material:	Glass		**Minutes per Point:**	120.0	
Nozzle Diameter:	0.271	**in.**	**Total Number of Traverse Points:**	1	
Train Type:	Hot Box		**Test Length:**	120	**min.**

STACK CONDITIONS			**MOISTURE DETERMINATION**		
Barometric Pressure (Pb):	29.10	**in. Hg.**	**Initial Impinger Content:**	6158.80	**mls.**
Static Pressure:	-11.00	**in. H_2O**	**Final Impinger Content:**	6240.60	**mls.**
Flue Pressure (Ps):	28.29	**in. Hg. abs.**	**Difference:**	81.80	
Sample Train Leak Check Pre:	0.005		**Silica Initial Wt.**	0.00	**grams**
Post:	0.003		**Silica Final Wt.**	0.00	**grams**
@	10/5	**in. Hg.**	**Difference:**	0.00	
Carbon Dioxide:	12.0	**%**	**Total Water Gain:**	81.80	
Oxygen:	7.0	**%**			
Nitrogen:	81.0	**%**			

STACK PARAMETERS

Delta H:	0.75	**Inches H_2O**	**Gas Weight dry, Md:**	30.200	**lb/lb mole**
Meter Temperature, Tm:	56.1	**°F**	**Gas Weight wet, Ms:**	29.505	**lb/lb mole**
Sqrt ΔP:	0.551	**Inches H_2O**	**Excess Air:**	48.665	**%**
Stack Temperature, Ts:	337.0	**°F**	**Gas Velocity, Vs:**	38.673	
Meter Volume, Vm:	64.249	**Cubic Feet**	**Volumetric Flow, ACFM:**	1,392,220	
Meter Volume, Vmstd:	63.790	**dscf**	**Volumetric Flow, DSCFM:**	822,394	
Meter Volume, Vwstd:	3.853	**wscf**	**Volumetric Flow, SCFM:**	872,065	
Moisture, Bws:	0.057		**Isokinetic Variance, %I:**	96.9	
Meter Volume, Normal	59.442				

EMISSION DATA

Type of Fuel Firing:	Coal
Fuel Factor F_d (dscf/mmBtu):	9780
List Mol. Wt. of Analyte if ppm needed:	200.590

Speciated Mercury

Particle Bound Mercury	
mg (net) collected:	0.000005
ppb:	0.000332
ug/dncm:	0.00
lb/hr:	0.000009
lb/mmBtu (based on Fd):	0.00000000
Elemental Mercury	
mg (net) collected:	0.00760
ppb:	0.504128
ug/dncm:	4.52
lb/hr:	0.012961
lb/mmBtu (based on Fd):	0.00000386
Oxidized Mercury	
mg (net) collected:	0.01860
ppb:	1.233786
ug/dncm:	11.05
lb/hr:	0.031719
lb/mmBtu (based on Fd):	0.00000945
Total Mercury	
mg (net) collected:	0.02621
ppb:	1.738246
ug/dncm:	15.57
lb/hr:	0.044688
lb/mmBtu (based on Fd):	0.00001332

TRAVERSE DATA: Ontario Hydro

Company: ADA
Plant: AEP Conesville
Location: Unit 6 ESP Outlet

Test Run: 2 **Test Date:** 3/16/2006
Start Time: 8:55
End Time: 10:55

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	8:55:00	0.31	0.76	26.15	0.557	325	52	48	3.0	2.747	38.77
1-2	9:00:00	0.31	0.76	28.90	0.557	325	53	48	3.0	2.640	38.77
1-3	9:05:00	0.31	0.76	31.54	0.557	337	55	49	3.0	2.660	39.07
1-4	9:10:00	0.31	0.76	34.20	0.557	337	56	50	4.0	2.710	39.07
1-5	9:15:00	0.31	0.76	36.91	0.557	337	57	50	4.0	2.690	39.07
1-6	9:20:00	0.31	0.76	39.60	0.557	337	58	51	4.0	2.710	39.07
1-7	9:25:00	0.31	0.76	42.31	0.557	337	58	52	4.0	2.760	39.07
1-8	9:30:00	0.31	0.76	45.07	0.557	338	59	52	4.0	2.720	39.09
1-9	9:35:00	0.31	0.76	47.79	0.557	338	59	53	4.0	2.720	39.09
1-10	9:40:00	0.30	0.74	50.51	0.548	338	59	53	4.0	2.680	38.46
1-11	9:45:00	0.30	0.74	53.19	0.548	338	59	53	4.0	2.680	38.46
1-12	9:50:00	0.30	0.74	55.87	0.548	338	59	53	4.0	2.680	38.46
1-13	9:55:00	0.30	0.74	58.55	0.548	338	60	54	4.0	2.650	38.46
1-14	10:00:00	0.30	0.74	61.20	0.548	338	60	54	4.0	2.650	38.46
1-15	10:05:00	0.30	0.74	63.85	0.548	338	60	55	4.0	2.660	38.46
1-16	10:10:00	0.30	0.74	66.51	0.548	338	60	55	4.0	2.580	38.46
1-17	10:15:00	0.30	0.74	69.09	0.548	339	60	55	4.0	2.640	38.48
1-18	10:20:00	0.30	0.74	71.73	0.548	339	60	55	4.0	2.670	38.48
1-19	10:25:00	0.30	0.74	74.40	0.548	339	61	55	4.0	2.650	38.48
1-20	10:30:00	0.30	0.74	77.05	0.548	340	61	55	4.0	2.650	38.51
1-21	10:35:00	0.30	0.74	79.70	0.548	339	62	56	4.0	2.650	38.48
1-22	10:40:00	0.30	0.74	82.35	0.548	338	63	57	4.0	2.700	38.46
1-23	10:45:00	0.30	0.74	85.05	0.548	339	63	57	4.0	2.690	38.48
1-24	10:50:00	0.30	0.74	87.74	0.548	339	63	57	4.0	2.662	38.48
	10:55:00			90.40							
			0.75	64.249	0.551	337	59	53		64.249	
							56.13				

Field Notes/Comments:

TEST DATA	- Ontario Hydro	Run No.: 3

Project Number: PE2006043 **Test Date:** 3/16/2006

TEST PARAMETERS

Company:	ADA		**Duct Shape:**	Rectangular	
Plant:	AEP Conesville		**Length:**	15.00	**Feet**
Test Location:	Unit 6 ESP Outlet		**Width:**	40.00	**Feet**
Source Condition:	Normal		**Duct Area:**	600.000	**Sq. Ft.**
Test Engineer:	JLH				
Temp ID:	CM-9		**Sample Plane:**	Vertical	
Meter ID:	CM-9		**Port Length:**		**in.**
Meter Calibration Factor:	0.996		**Port Size (diameter):**	4.00	**in.**
Pitot ID:	005A		**Port Type:**	Flange	
Pitot Tube Coefficient:	0.840		**Number of Ports Sampled:**	1	
Probe Length:	10.0	**ft.**	**Number of Points per Port:**	1	
Probe Liner Material:	Glass		**Minutes per Point:**	120.0	
Nozzle Diameter:	0.271	**in.**	**Total Number of Traverse Points:**	1	
Train Type:	Hot Box		**Test Length:**	120	**min.**

STACK CONDITIONS / **MOISTURE DETERMINATION**

Barometric Pressure (Pb):	29.10	**in. Hg.**	**Initial Impinger Content:**	5619.60	**mls.**
Static Pressure:	-11.00	**in. H_2O**	**Final Impinger Content:**	5713.40	**mls.**
Flue Pressure (Ps):	28.29	**in. Hg. abs.**	**Difference:**	93.80	
Sample Train Pre:	0.005		**Silica Initial Wt.**	0.00	**grams**
Leak Check Post:	0.006		**Silica Final Wt.**	0.00	**grams**
@	10/5	**in. Hg.**	**Difference:**	0.00	
Carbon Dioxide:	12.0	**%**	**Total Water Gain:**	93.80	
Oxygen:	7.0	**%**			
Nitrogen:	81.0	**%**			

STACK PARAMETERS

Delta H:	0.75	**Inches H_2O**	**Gas Weight dry, Md:**	30.200	**lb/lb mole**
Meter Temperature, Tm:	64.9	**°F**	**Gas Weight wet, Ms:**	29.410	**lb/lb mole**
Sqrt ΔP:	0.547	**Inches H_2O**	**Excess Air:**	48.665	**%**
Stack Temperature, Ts:	339.3	**°F**	**Gas Velocity, Vs:**	38.498	
Meter Volume, Vm:	65.370	**Cubic Feet**	**Volumetric Flow, ACFM:**	1,385,922	
Meter Volume, Vmstd:	63.821	**dscf**	**Volumetric Flow, DSCFM:**	809,588	
Meter Volume, Vwstd:	4.418	**wscf**	**Volumetric Flow, SCFM:**	865,631	
Moisture, Bws:	0.065		**Isokinetic Variance, %I:**	98.5	
Meter Volume, Normal	59.471				

EMISSION DATA

Type of Fuel Firing:	Coal
Fuel Factor F_d (dscf/mmBtu):	9780
List Mol. Wt. of Analyte if ppm needed:	200.590

Speciated Mercury

Particle Bound Mercury	
mg (net) collected:	0.000005
ppb:	0.000332
ug/dncm:	0.00
lb/hr:	0.000008
lb/mmBtu (based on Fd):	0.00000000
Elemental Mercury	
mg (net) collected:	0.0089
ppb:	0.587420
ug/dncm:	5.26
lb/hr:	0.014867
lb/mmBtu (based on Fd):	0.00000450
Oxidized Mercury	
mg (net) collected:	0.02750
ppb:	1.823256
ug/dncm:	16.33
lb/hr:	0.046144
lb/mmBtu (based on Fd):	0.00001397
Total Mercury	
mg (net) collected:	0.03637
ppb:	2.411008
ug/dncm:	21.59
lb/hr:	0.061019
lb/mmBtu (based on Fd):	0.00001847

TRAVERSE DATA: Ontario Hydro

Company: ADA
Plant: AEP Conesville
Location: Unit 6 ESP Outlet

Test Run: 3 **Test Date:** 3/16/2006
Start Time: 11:30
End Time: 13:30

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	11:30:00	0.29	0.73	91.48	0.539	338	61	59	4.0	2.711	37.81
1-2	11:35:00	0.29	0.73	94.19	0.539	339	62	59	4.0	2.690	37.83
1-3	11:40:00	0.30	0.75	96.88	0.548	339	63	59	4.0	2.750	38.48
1-4	11:45:00	0.30	0.75	99.63	0.548	340	65	60	4.0	2.730	38.51
1-5	11:50:00	0.30	0.75	102.36	0.548	340	66	60	4.0	2.740	38.51
1-6	11:55:00	0.30	0.75	105.10	0.548	340	66	60	4.0	2.760	38.51
1-7	12:00:00	0.30	0.75	107.86	0.548	340	66	61	4.0	2.690	38.51
1-8	12:05:00	0.30	0.75	110.55	0.548	339	67	61	4.0	2.730	38.48
1-9	12:10:00	0.30	0.75	113.28	0.548	339	67	61	4.0	2.730	38.48
1-10	12:15:00	0.30	0.75	116.01	0.548	340	67	62	4.0	2.690	38.51
1-11	12:20:00	0.30	0.75	118.70	0.548	340	68	62	4.0	2.690	38.51
1-12	12:25:00	0.30	0.75	121.39	0.548	339	68	62	4.0	2.810	38.48
1-13	12:30:00	0.30	0.75	124.20	0.548	339	68	63	4.0	2.680	38.48
1-14	12:35:00	0.30	0.75	126.88	0.548	339	69	63	4.0	2.700	38.48
1-15	12:40:00	0.30	0.75	129.58	0.548	338	69	63	4.0	2.730	38.46
1-16	12:45:00	0.30	0.75	132.31	0.548	338	69	64	4.0	2.720	38.46
1-17	12:50:00	0.30	0.75	135.03	0.548	339	69	64	4.0	2.680	38.48
1-18	12:55:00	0.30	0.75	137.71	0.548	339	69	64	4.0	2.690	38.48
1-19	13:00:00	0.30	0.75	140.40	0.548	340	70	64	4.0	2.780	38.51
1-20	13:05:00	0.30	0.75	143.18	0.548	340	70	64	4.0	2.730	38.51
1-21	13:10:00	0.30	0.75	145.91	0.548	339	70	65	4.0	2.740	38.48
1-22	13:15:00	0.30	0.75	148.65	0.548	340	70	65	4.0	2.740	38.51
1-23	13:20:00	0.30	0.75	151.39	0.548	340	70	65	4.0	2.730	38.51
1-24	13:25:00	0.30	0.75	154.12	0.548	340	70	65	4.0	2.729	38.51
	13:30:00			156.85							
			0.75	65.370	0.547	339	67	62		65.370	
							64.88				

Field Notes/Comments:

TEST DATA - Ontario Hydro   Run No.: 4

Project Number: PE2006043   **Test Date:** 3/17/2006

TEST PARAMETERS

Company:	ADA		**Duct Shape:**	Rectangular	
Plant:	AEP Conesville		**Length:**	15.00	**Feet**
Test Location:	Unit 6 ESP Outlet		**Width:**	40.00	**Feet**
Source Condition:	Normal		**Duct Area:**	600.000	**Sq. Ft.**
Test Engineer:	JLH				
Temp ID:	CM-9		**Sample Plane:**	Vertical	
Meter ID:	CM-9		**Port Length:**		**in.**
Meter Calibration Factor:	0.996		**Port Size (diameter):**	4.00	**in.**
Pitot ID:	005A		**Port Type:**	Flange	
Pitot Tube Coefficient:	0.840		**Number of Ports Sampled:**	1	
Probe Length:	10.0	**ft.**	**Number of Points per Port:**	1	
Probe Liner Material:	Glass		**Minutes per Point:**	120.0	
Nozzle Diameter:	0.271	**in.**	**Total Number of Traverse Points:**	1	
Train Type:	Hot Box		**Test Length:**	120	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):		29.23	**in. Hg.**
Static Pressure:		-11.00	**in. H_2O**
Flue Pressure (Ps):		28.42	**in. Hg. abs.**
Sample Train	**Pre:**	0.002	
Leak Check	**Post:**	0.005	
	@	10/5	**in. Hg.**
Carbon Dioxide:		12.0	**%**
Oxygen:		7.0	**%**
Nitrogen:		81.0	**%**

MOISTURE DETERMINATION

Initial Impinger Content:	5701.80	**mls.**
Final Impinger Content:	5812.00	**mls.**
Difference:	110.20	
Silica Initial Wt.	0.00	**grams**
Silica Final Wt.	0.00	**grams**
Difference:	0.00	
Total Water Gain:	110.20	

STACK PARAMETERS

Delta H:	0.83	**Inches H_2O**	**Gas Weight dry, Md:**	30.200	**lb/lb mole**
Meter Temperature, Tm:	47.2	**°F**	**Gas Weight wet, Ms:**	29.334	**lb/lb mole**
Sqrt ΔP:	0.582	**Inches H_2O**	**Excess Air:**	48.665	**%**
Stack Temperature, Ts:	330.9	**°F**	**Gas Velocity, Vs:**	40.682	
Meter Volume, Vm:	66.890	**Cubic Feet**	**Volumetric Flow, ACFM:**	1,464,552	
Meter Volume, Vmstd:	67.897	**dscf**	**Volumetric Flow, DSCFM:**	862,816	
Meter Volume, Vwstd:	5.190	**wscf**	**Volumetric Flow, SCFM:**	928,774	
Moisture, Bws:	0.071		**Isokinetic Variance, %I:**	98.3	
Meter Volume, Normal	63.269				

EMISSION DATA

Type of Fuel Firing:	Coal
Fuel Factor F_d (dscf/mmBtu):	9780
List Mol. Wt. of Analyte if ppm needed:	200.590

Speciated Mercury

Particle Bound Mercury	
mg (net) collected:	0.000007
ppb:	0.000436
ug/dncm:	0.00
lb/hr:	0.000012
lb/mmBtu (based on Fd):	0.00000000
Elemental Mercury	
mg (net) collected:	0.0226
ppb:	1.406565
ug/dncm:	12.60
lb/hr:	0.037939
lb/mmBtu (based on Fd):	0.00001078
Oxidized Mercury	
mg (net) collected:	0.07790
ppb:	4.854737
ug/dncm:	43.48
lb/hr:	0.130945
lb/mmBtu (based on Fd):	0.00003720
Total Mercury	
mg (net) collected:	0.10048
ppb:	6.261739
ug/dncm:	56.08
lb/hr:	0.168895
lb/mmBtu (based on Fd):	0.00004798

TRAVERSE DATA: Ontario Hydro

Company: ADA
Plant: AEP Conesville
Location: Unit 6 ESP Outlet

Test Run: 4 **Test Date:** 3/17/2006
Start Time: 8:05
End Time: 10:05

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	8:05:00	0.32	0.78	22.01	0.566	328	45	42	5.0	2.770	39.47
1-2	8:10:00	0.32	0.78	24.78	0.566	328	45	42	5.0	2.690	39.47
1-3	8:15:00	0.34	0.83	27.47	0.583	329	47	42	5.0	2.810	40.71
1-4	8:20:00	0.34	0.83	30.28	0.583	329	48	42	5.0	2.760	40.71
1-5	8:25:00	0.34	0.83	33.04	0.583	330	49	42	5.0	2.800	40.74
1-6	8:30:00	0.34	0.83	35.84	0.583	330	49	43	5.0	2.790	40.74
1-7	8:35:00	0.34	0.83	38.63	0.583	330	50	43	5.0	2.790	40.74
1-8	8:40:00	0.34	0.83	41.42	0.583	331	50	44	5.0	2.770	40.76
1-9	8:45:00	0.34	0.83	44.19	0.583	331	51	44	5.0	2.770	40.76
1-10	8:50:00	0.34	0.83	46.96	0.583	331	51	44	5.0	2.770	40.76
1-11	8:55:00	0.34	0.83	49.73	0.583	331	51	44	5.0	2.790	40.76
1-12	9:00:00	0.34	0.83	52.52	0.583	332	51	45	5.0	2.770	40.79
1-13	9:05:00	0.34	0.83	55.29	0.583	331	51	45	5.0	2.780	40.76
1-14	9:10:00	0.34	0.83	58.07	0.583	332	51	45	5.0	2.740	40.79
1-15	9:15:00	0.34	0.83	60.81	0.583	331	51	45	5.0	2.890	40.76
1-16	9:20:00	0.34	0.83	63.70	0.583	332	51	46	5.0	2.800	40.79
1-17	9:25:00	0.34	0.83	66.50	0.583	332	51	46	5.0	2.800	40.79
1-18	9:30:00	0.34	0.83	69.30	0.583	331	51	46	5.0	2.800	40.76
1-19	9:35:00	0.34	0.83	72.10	0.583	332	51	46	5.0	2.800	40.79
1-20	9:40:00	0.34	0.83	74.90	0.583	332	51	46	5.0	2.810	40.79
1-21	9:45:00	0.34	0.83	77.71	0.583	332	51	46	5.0	2.780	40.79
1-22	9:50:00	0.34	0.83	80.49	0.583	332	51	46	5.0	2.790	40.79
1-23	9:55:00	0.34	0.83	83.28	0.583	332	51	46	5.0	2.810	40.79
1-24	10:00:00	0.34	0.83	86.09	0.583	332	51	46	5.0	2.810	40.79
	10:05:00			88.90							
			0.83	66.890	0.582	331	50	44		66.890	
							47.19				

Field Notes/Comments:

TEST DATA	- Ontario Hydro	Run No.: 1

Project Number: PE2006043 **Test Date:** 3/17/2006

TEST PARAMETERS

Company:	ADA		**Duct Shape:**	Rectangular	
Plant:	AEP Conesville		**Length:**	26.00	**Feet**
Test Location:	Unit 6 FGD Outlet		**Width:**	20.00	**Feet**
Source Condition:	Normal		**Duct Area:**	520.000	**Sq. Ft.**
Test Engineer:	JLH				
Temp ID:	CM-10		**Sample Plane:**	Horizontal	
Meter ID:	CM-10		**Port Length:**		**in.**
Meter Calibration Factor:	1.000		**Port Size (diameter):**	4.00	**in.**
Pitot ID:	005A		**Port Type:**	Nipple	
Pitot Tube Coefficient:	0.840		**Number of Ports Sampled:**	8	
Probe Length:	10.0	**ft.**	**Number of Points per Port:**	2	
Probe Liner Material:	Glass		**Minutes per Point:**	5.0	
Nozzle Diameter:	0.135	**in.**	**Total Number of Traverse Points:**	16	
Train Type:	Hot Box		**Test Length:**	80	**min.**

STACK CONDITIONS / **MOISTURE DETERMINATION**

Barometric Pressure (Pb):	29.23	**in. Hg.**	**Initial Impinger Content:**	6057.00	**mls.**
Static Pressure:	1.00	**in. H_2O**	**Final Impinger Content:**	6163.20	**mls.**
Flue Pressure (Ps):	29.30	**in. Hg. abs.**	**Difference:**	106.20	
Sample Train Leak Check Pre:	0.002		**Silica Initial Wt.**	0.00	**grams**
Post:	0.018		**Silica Final Wt.**	0.00	**grams**
@	10/5	**in. Hg.**	**Difference:**	0.00	
Carbon Dioxide:	12.0	**%**	**Total Water Gain:**	106.20	
Oxygen:	7.0	**%**			
Nitrogen:	81.0	**%**			

STACK PARAMETERS

Delta H:	0.56	**Inches H_2O**	**Gas Weight dry, Md:**	30.200	**lb/lb mole**
Meter Temperature, Tm:	52.1	**°F**	**Gas Weight wet, Ms:**	28.755	**lb/lb mole**
Sqrt ΔP:	1.646	**Inches H_2O**	**Excess Air:**	48.665	**%**
Stack Temperature, Ts:	125.3	**°F**	**Gas Velocity, Vs:**	98.540	
Meter Volume, Vm:	36.906	**Cubic Feet**	**Volumetric Flow, ACFM:**	3,074,462	
Meter Volume, Vmstd:	37.230	**dscf**	**Volumetric Flow, DSCFM:**	2,394,545	
Meter Volume, Vwstd:	5.002	**wscf**	**Volumetric Flow, SCFM:**	2,716,265	
Moisture, Bws:	0.118		**Isokinetic Variance, %I:**	101.7	
Meter Volume, Normal	34.692				

EMISSION DATA

Type of Fuel Firing: Coal
Fuel Factor F_d (dscf/mmBtu): 9780
List Mol. Wt. of Analyte if ppm needed: 200.590

Speciated Mercury

Particle Bound Mercury	
mg (net) collected:	0.000005
ppb:	0.000568
ug/dncm:	0.01
lb/hr:	0.000043
lb/mmBtu (based on Fd):	0.00000000
Elemental Mercury	
mg (net) collected:	0.01337
ppb:	1.519577
ug/dncm:	13.61
lb/hr:	0.113750
lb/mmBtu (based on Fd):	0.00001164
Oxidized Mercury	
mg (net) collected:	0.00265
ppb:	0.301188
ug/dncm:	2.70
lb/hr:	0.022546
lb/mmBtu (based on Fd):	0.00000231
Total Mercury	
mg (net) collected:	0.01603
ppb:	1.821333
ug/dncm:	16.31
lb/hr:	0.136338
lb/mmBtu (based on Fd):	0.00001395

TRAVERSE DATA: Ontario Hydro

Company: ADA
Plant: AEP Conesville
Location: Unit 6 FGD Outlet

Test Run: 1
Start Time: 11:25
End Time: 12:58
Test Date: 3/17/2006

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	11:25:00	3.10	0.65	4.70	1.761	125	49	47	3.0	2.485	105.35
1-2	11:30:00	2.80	0.59	7.18	1.673	126	50	48	3.0	2.376	100.21
	11:35:00			9.56							
2-1	11:36:00	2.90	0.61	9.56	1.703	125	52	49	3.0	2.424	101.90
2-2	11:41:00	2.60	0.54	11.98	1.612	125	54	49	3.0	2.305	96.48
	11:46:00			14.29							
3-1	11:47:00	2.70	0.56	14.29	1.643	126	55	50	3.0	2.295	98.40
3-2	11:52:00	2.70	0.56	16.58	1.643	125	56	50	3.0	2.352	98.32
	11:57:00			18.93							
4-1	11:58:00	2.80	0.58	18.93	1.673	126	56	51	3.0	2.378	100.21
4-2	12:03:00	2.80	0.58	21.31	1.673	126	56	51	3.0	1.795	100.21
	12:08:00			23.11							
5-1	12:15:00	2.80	0.58	23.11	1.673	125	53	50	3.0	2.405	100.12
5-2	12:20:00	2.60	0.54	25.51	1.612	126	54	50	3.0	2.300	96.56
	12:25:00			27.81							
6-1	12:26:00	2.60	0.54	27.81	1.612	128	53	50	3.0	2.290	96.73
6-2	12:31:00	2.60	0.54	30.10	1.612	124	55	51	3.0	2.301	96.40
	12:36:00			32.40							
7-1	12:37:00	2.60	0.54	32.40	1.612	124	55	51	3.0	2.479	96.40
7-2	12:42:00	2.60	0.54	34.88	1.612	124	56	52	3.0	2.120	96.40
	12:47:00			37.00							
8-1	12:48:00	2.60	0.54	37.00	1.612	125	55	52	3.0	2.310	96.48
8-2	12:53:00	2.60	0.54	39.31	1.612	125	55	51	3.0	2.291	96.48
	12:58:00			41.60							
			0.56	36.906	1.646	125	54	50		36.906	
							52.06				

Field Notes/Comments:

TEST DATA	- Ontario Hydro	Run No.: 2

Project Number: PE2006043 **Test Date:** 3/17/2006

TEST PARAMETERS

Company:	ADA		**Duct Shape:**	Rectangular	
Plant:	AEP Conesville		**Length:**	26.00	**Feet**
Test Location:	Unit 6 FGD Outlet		**Width:**	20.00	**Feet**
Source Condition:	Normal		**Duct Area:**	520.000	**Sq. Ft.**
Test Engineer:	JLH				
Temp ID:	CM-10		**Sample Plane:**	Horizontal	
Meter ID:	CM-10		**Port Length:**		**in.**
Meter Calibration Factor:	1.000		**Port Size (diameter):**	4.00	**in.**
Pitot ID:	005A		**Port Type:**	Nipple	
Pitot Tube Coefficient:	0.840		**Number of Ports Sampled:**	8	
Probe Length:	10.0	**ft.**	**Number of Points per Port:**	2	
Probe Liner Material:	Glass		**Minutes per Point:**	5.0	
Nozzle Diameter:	0.135	**in.**	**Total Number of Traverse Points:**	16	
Train Type:	Hot Box		**Test Length:**	80	**min.**

STACK CONDITIONS / **MOISTURE DETERMINATION**

Barometric Pressure (Pb):	29.23	**in. Hg.**	**Initial Impinger Content:**	5700.80	**mls.**
Static Pressure:	1.00	**in. H_2O**	**Final Impinger Content:**	5876.00	**mls.**
Flue Pressure (Ps):	29.30	**in. Hg. abs.**	**Difference:**	175.20	
Sample Train Pre:	0.006		**Silica Initial Wt.**	0.00	**grams**
Leak Check Post:	0.005		**Silica Final Wt.**	0.00	**grams**
@	10/6	**in. Hg.**	**Difference:**	0.00	
Carbon Dioxide:	12.0	**%**	**Total Water Gain:**	175.20	
Oxygen:	7.0	**%**			
Nitrogen:	81.0	**%**			

STACK PARAMETERS

Delta H:	0.56	**Inches H_2O**	**Gas Weight dry, Md:**	30.200	**lb/lb mole**
Meter Temperature, Tm:	53.7	**°F**	**Gas Weight wet, Ms:**	28.638	**lb/lb mole**
Sqrt ΔP:	1.635	**Inches H_2O**	**Excess Air:**	48.665	**%**
Stack Temperature, Ts:	123.0	**°F**	**Gas Velocity, Vs:**	97.871	
Meter Volume, Vm:	37.478	**Cubic Feet**	**Volumetric Flow, ACFM:**	3,053,578	
Meter Volume, Vmstd:	37.689	**dscf**	**Volumetric Flow, DSCFM:**	2,361,825	
Meter Volume, Vwstd:	8.252	**wscf**	**Volumetric Flow, SCFM:**	2,708,515	
Moisture, Bws:	0.180		**Isokinetic Variance, %I:**	104.4	
Supersaturation Value, Bws:	0.128*				
Meter Volume, Normal	35.120				

EMISSION DATA

Type of Fuel Firing:	Coal
Fuel Factor F_d (dscf/mmBtu):	9780
List Mol. Wt. of Analyte if ppm needed:	200.590

Speciated Mercury

Particle Bound Mercury	
mg (net) collected:	0.000005
ppb:	0.000561
ug/dncm:	0.01
lb/hr:	0.000041
lb/mmBtu (based on Fd):	0.00000000
Elemental Mercury	
mg (net) collected:	0.0135
ppb:	1.515649
ug/dncm:	13.57
lb/hr:	0.111905
lb/mmBtu (based on Fd):	0.00001161
Oxidized Mercury	
mg (net) collected:	0.00094
ppb:	0.105534
ug/dncm:	0.95
lb/hr:	0.007792
lb/mmBtu (based on Fd):	0.00000081
Total Mercury	
mg (net) collected:	0.01445
ppb:	1.621745
ug/dncm:	14.53
lb/hr:	0.119739
lb/mmBtu (based on Fd):	0.00001243

TRAVERSE DATA: Ontario Hydro

Company: ADA
Plant: AEP Conesville
Location: Unit 6 FGD Outlet

Test Run: 2
Start Time: 13:20
End Time: 15:02
Test Date: 3/17/2006

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	13:20:00	2.10	0.44	41.87	1.449	122	51	50	4.0	2.062	86.49
1-2	13:25:00	2.40	0.50	43.93	1.549	123	53	51	4.0	2.201	92.54
	13:30:00			46.13							
2-1	13:31:00	2.40	0.50	46.13	1.549	122	54	51	4.0	2.239	92.46
2-2	13:36:00	2.40	0.50	48.37	1.549	127	56	51	4.0	2.192	92.85
	13:41:00			50.56							
3-1	13:42:00	2.60	0.55	50.56	1.612	127	57	52	4.0	2.298	96.65
3-2	13:47:00	2.60	0.55	52.86	1.612	128	58	52	4.0	2.292	96.73
	13:52:00			55.15							
4-1	13:53:00	2.70	0.56	55.15	1.643	127	57	52	4.0	2.338	98.49
4-2	13:58:00	2.70	0.56	57.49	1.643	129	53	51	4.0	2.333	98.65
	14:03:00			59.82							
5-1	14:19:00	2.50	0.52	59.82	1.581	120	55	53	4.0	2.367	94.20
5-2	14:24:00	2.50	0.52	62.19	1.581	120	56	53	4.0	2.340	94.20
	14:29:00			64.53							
6-1	14:30:00	3.00	0.63	64.53	1.732	119	56	53	4.0	2.460	103.10
6-2	14:35:00	3.00	0.63	66.99	1.732	121	57	53	4.0	2.463	103.28
	14:40:00			69.45							
7-1	14:41:00	3.00	0.63	69.45	1.732	121	56	53	4.0	2.507	103.28
7-2	14:46:00	3.00	0.63	71.96	1.732	121	56	53	4.0	2.465	103.28
	14:51:00			74.43							
8-1	14:52:00	3.00	0.63	74.43	1.732	120	55	52	4.0	2.455	103.19
8-2	14:57:00	3.00	0.63	76.88	1.732	121	55	52	4.0	2.466	103.28
	15:02:00			79.35							
			0.56	37.478	1.635	123	55	52		37.478	
							53.66				

Field Notes/Comments:

TEST DATA	- Ontario Hydro	Run No.: 3

Project Number: PE2006043 **Test Date:** 3/17/2006

TEST PARAMETERS

Company:	ADA		Duct Shape:	Rectangular	
Plant:	AEP Conesville		Length:	26.00	Feet
Test Location:	Unit 6 FGD Outlet		Width:	20.00	Feet
Source Condition:	Normal		Duct Area:	520.000	Sq. Ft.
Test Engineer:	JLH				
Temp ID:	CM-10		Sample Plane:	Horizontal	
Meter ID:	CM-10		Port Length:		in.
Meter Calibration Factor:	1.000		Port Size (diameter):	4.00	in.
Pitot ID:	005A		Port Type:	Nipple	
Pitot Tube Coefficient:	0.840		Number of Ports Sampled:	8	
Probe Length:	10.0	ft.	Number of Points per Port:	2	
Probe Liner Material:	Glass		Minutes per Point:	5.0	
Nozzle Diameter:	0.135	in.	Total Number of Traverse Points:	16	
Train Type:	Hot Box		Test Length:	80	min.

STACK CONDITIONS / **MOISTURE DETERMINATION**

Barometric Pressure (Pb):	29.23	in. Hg.	Initial Impinger Content:	6114.60	mls.
Static Pressure:	1.00	in. H_2O	Final Impinger Content:	6187.40	mls.
Flue Pressure (Ps):	29.30	in. Hg. abs.	Difference:	72.80	
Sample Train Pre:	0.002		Silica Initial Wt.	0.00	grams
Leak Check Post:	0.005		Silica Final Wt.	0.00	grams
@	10/5	in. Hg.	Difference:	0.00	
Carbon Dioxide:	12.0	%	Total Water Gain:	72.80	
Oxygen:	7.0	%			
Nitrogen:	81.0	%			

STACK PARAMETERS

Delta H:	0.55	Inches H_2O	Gas Weight dry, Md:	30.200	lb/lb mole
Meter Temperature, Tm:	50.3	°F	Gas Weight wet, Ms:	29.173	lb/lb mole
Sqrt ΔP:	1.620	Inches H_2O	Excess Air:	48.665	%
Stack Temperature, Ts:	122.9	°F	Gas Velocity, Vs:	96.070	
Meter Volume, Vm:	36.843	Cubic Feet	Volumetric Flow, ACFM:	2,997,377	
Meter Volume, Vmstd:	37.295	dscf	Volumetric Flow, DSCFM:	2,435,069	
Meter Volume, Vwstd:	3.429	wscf	Volumetric Flow, SCFM:	2,658,950	
Moisture, Bws:	0.084		Isokinetic Variance, %I:	100.2	
Meter Volume, Normal	34.752				

EMISSION DATA

Type of Fuel Firing:	Coal
Fuel Factor F_d (dscf/mmBtu):	9780
List Mol. Wt. of Analyte if ppm needed:	200.590

Speciated Mercury

Particle Bound Mercury	
mg (net) collected:	0.000005
ppb:	0.000567
ug/dncm:	0.01
lb/hr:	0.000043
lb/mmBtu (based on Fd):	0.00000000
Elemental Mercury	
mg (net) collected:	0.0071
ppb:	0.804418
ug/dncm:	7.20
lb/hr:	0.061235
lb/mmBtu (based on Fd):	0.00000616
Oxidized Mercury	
mg (net) collected:	0.00077
ppb:	0.087363
ug/dncm:	0.78
lb/hr:	0.006650
lb/mmBtu (based on Fd):	0.00000067
Total Mercury	
mg (net) collected:	0.00787
ppb:	0.892348
ug/dncm:	7.99
lb/hr:	0.067928
lb/mmBtu (based on Fd):	0.00000684

TRAVERSE DATA: Ontario Hydro

Company: ADA
Plant: AEP Conesville
Location: Unit 6 FGD Outlet

Test Run: 3 **Test Date:** 3/17/2006
Start Time: 15:25
End Time: 16:59

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	15:25:00	2.60	0.54	79.62	1.612	119	51	50	2.0	2.318	95.99
1-2	15:30:00	2.60	0.54	81.94	1.612	121	52	50	2.0	2.308	96.15
	15:35:00			84.25							
2-1	15:36:00	2.60	0.54	84.25	1.612	121	52	50	2.0	2.292	96.15
2-2	15:41:00	2.60	0.54	86.54	1.612	119	52	49	2.0	2.292	95.99
	15:46:00			88.83							
3-1	15:47:00	2.60	0.54	88.83	1.612	120	51	49	2.0	2.268	96.07
3-2	15:52:00	2.60	0.54	91.10	1.612	120	53	50	2.0	2.289	96.07
	15:57:00			93.39							
4-1	15:58:00	2.60	0.54	93.39	1.612	120	52	49	2.0	2.251	96.07
4-2	16:03:00	2.60	0.54	95.64	1.612	120	52	49	2.0	2.291	96.07
	16:08:00			97.93							
5-1	16:16:00	2.70	0.57	97.93	1.643	125	50	49	3.0	2.359	98.32
5-2	16:21:00	2.70	0.57	100.29	1.643	125	51	49	3.0	2.340	98.32
	16:26:00			102.63							
6-1	16:27:00	2.70	0.57	102.63	1.643	125	50	49	3.0	2.300	98.32
6-2	16:32:00	2.70	0.57	104.93	1.643	124	52	48	3.0	2.354	98.23
	16:37:00			107.28							
7-1	16:38:00	2.70	0.57	107.28	1.643	126	52	48	3.0	2.316	98.40
7-2	16:43:00	2.70	0.57	109.60	1.643	126	52	48	3.0	2.382	98.40
	16:48:00			111.98							
8-1	16:49:00	2.50	0.53	111.98	1.581	128	52	48	3.0	2.238	94.85
8-2	16:54:00	2.50	0.53	114.22	1.581	128	52	48	3.0	2.245	94.85
	16:59:00			116.47							
			0.55	36.843	1.620	123	52	49		36.843	
							50.28				

Field Notes/Comments:

TEST DATA	- Method 5/26A	Run No.: 1

Project Number: PE2006043 **Test Date:** 3/14/2006

TEST PARAMETERS

Company:	ADA	
Plant:	AEP Conesville	
Test Location:	Unit 6 ESP Outlet	
Source Condition:	Normal	
Test Engineer:	JLH	
Temp ID:	CM-9	
Meter ID:	CM-9	
Meter Calibration Factor:	0.996	
Pitot ID:	005A	
Pitot Tube Coefficient:	0.840	
Probe Length:	10.0	**ft.**
Probe Liner Material:	Glass	
Nozzle Diameter:	0.327	**in.**
Train Type:	Hot Box	

Duct Shape:	Rectangular	
Length:	15.00	**Feet**
Width:	40.00	**Feet**
Duct Area:	600.000	**Sq. Ft.**
Sample Plane:	Vertical	
Port Length:		**in.**
Port Size (diameter):	4.00	**in.**
Port Type:	Flange	
Number of Ports Sampled:	4	
Number of Points per Port:	2	
Minutes per Point:	7.5	
Total Number of Traverse Points:	8	
Test Length:	60	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	28.90	**in. Hg.**
Static Pressure:	-10.00	**in. H_2O**
Flue Pressure (Ps):	28.16	**in. Hg. abs.**
Sample Train Leak Check Pre:	0.005	
Post:	0.008	
@	10/5	**in. Hg.**
Carbon Dioxide:	12.0	**%**
Oxygen:	7.0	**%**
Nitrogen:	81.0	**%**

MOISTURE DETERMINATION

Initial Impinger Content:	3858.40	**mls.**
Final Impinger Content:	3910.80	**mls.**
Difference:	52.40	
Silica Initial Wt.	0.00	**grams**
Silica Final Wt.	0.00	**grams**
Difference:	0.00	
Total Water Gain:	52.40	

STACK PARAMETERS

Delta H:	1.35	**Inches H_2O**
Meter Temperature, Tm:	54.0	**°F**
Sqrt ΔP:	0.509	**Inches H_2O**
Stack Temperature, Ts:	328.6	**°F**
Meter Volume, Vm:	43.911	**Cubic Feet**
Meter Volume, Vmstd:	43.544	**dscf**
Meter Volume, Vwstd:	2.468	**wscf**
Moisture, Bws:	0.054	
Meter Volume, Normal	40.576	

Gas Weight dry, Md:	30.200	**lb/lb mole**
Gas Weight wet, Ms:	29.546	**lb/lb mole**
Excess Air:	48.665	**%**
Gas Velocity, Vs:	35.596	
Volumetric Flow, ACFM:	1,281,445	
Volumetric Flow, DSCFM:	764,298	
Volumetric Flow, SCFM:	807,617	
Isokinetic Variance, %I:	97.7	

EMISSION DATA

Type of Fuel Firing:	Coal
Fuel Factor F_d (dscf/mmBtu):	9780
List Mol. Wt. of Analyte if ppm needed:	36.461

	Filterable
Sample ID:	
Item:	Filter
PM, grams (net) collected:	0.0116
PM, grains/acf:	0.002
PM, grains/dscf:	0.004
mg/dncm:	10.0960
PM, lb/hr:	26.928
PM lb/mmBtu (based on Fd):	0.009

36.461

HCl		
mg (net) collected:	22.40	---
ppm:	11.98	---
ug/dncm:	19495.71	---
lb/hr:	52.0078	---
lb/mmBtu (based on Fd):	0.01668	---

HBr		
mg (net) collected:	0.92	---
ppm:	0.22	---
ug/dncm:	800.72	---
lb/hr:	2.1360	---
lb/mmBtu (based on Fd):	0.00068	---

20.006

HF		
mg (net) collected:	1.11	---
ppm:	1.08	---
ug/dncm:	966.08	---
lb/hr:	2.5772	---
lb/mmBtu (based on Fd):	0.00083	---

70.906

Cl_2		
mg (net) collected:	105.00	---
ppm:	28.86	---
ug/dncm:	91386.15	---
lb/hr:	243.7866	---
lb/mmBtu (based on Fd):	0.07817	---

159.818

Br_2		
mg (net) collected:	1.32	---
ppm:	0.16	---
ug/dncm:	1148.85	---
lb/hr:	3.0647	---
lb/mmBtu (based on Fd):	0.00098	---

TRAVERSE DATA: Method 5/26A

Company: ADA
Plant: AEP Conesville
Location: Unit 6 ESP Outlet

Test Run: 1 **Test Date:** 3/14/2006
Start Time: 10:00
End Time: 11:17

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	10:00:00	0.25	1.30	35.56	0.500	334	52	51	4.0	5.443	35.07
1-2	10:07:30	0.27	1.40	41.00	0.520	326	55	51	4.0	5.397	36.27
	10:15:00			46.40							
2-1	10:19:00	0.27	1.40	46.69	0.520	324	57	51	4.0	5.802	36.22
2-2	10:26:30	0.25	1.30	52.49	0.500	326	58	52	3.0	5.503	34.90
	10:34:00			57.99							
3-1	10:47:00	0.20	1.00	58.63	0.447	326	55	52	4.0	4.800	31.21
3-2	10:54:30	0.27	1.40	63.43	0.520	328	58	52	4.0	5.556	36.31
	11:02:00			68.99							
4-1	11:02:00	0.27	1.40	69.03	0.520	331	58	52	5.0	5.504	36.38
4-2	11:09:30	0.30	1.60	74.53	0.548	334	58	52	5.0	5.906	38.42
	11:17:00			80.44							
			1.35	43.911	0.509	329	56	52		43.911	
							54.00				

Field Notes/Comments:

TEST DATA	- Method 5/26A	Run No.: 3

Project Number: PE2006043 **Test Date:** 3/14/2006

TEST PARAMETERS

Company:	ADA	
Plant:	AEP Conesville	
Test Location:	Unit 6 ESP Outlet	
Source Condition:	Normal	
Test Engineer:	JLH	
Temp ID:	CM-9	
Meter ID:	CM-9	
Meter Calibration Factor:	0.996	
Pitot ID:	005A	
Pitot Tube Coefficient:	0.840	
Probe Length:	10.0	**ft.**
Probe Liner Material:	Glass	
Nozzle Diameter:	0.327	**in.**
Train Type:	Hot Box	

Duct Shape:	Rectangular	
Length:	15.00	**Feet**
Width:	40.00	**Feet**
Duct Area:	600.000	**Sq. Ft.**
Sample Plane:	Vertical	
Port Length:		**in.**
Port Size (diameter):	4.00	**in.**
Port Type:	Flange	
Number of Ports Sampled:	4	
Number of Points per Port:	2	
Minutes per Point:	7.5	
Total Number of Traverse Points:	8	
Test Length:	60	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	28.90	**in. Hg.**
Static Pressure:	-10.00	**in. H_2O**
Flue Pressure (Ps):	28.16	**in. Hg. abs.**
Sample Train Leak Check Pre:	0.005	
Post:	0.020	
@	10/5	**in. Hg.**
Carbon Dioxide:	12.0	**%**
Oxygen:	7.0	**%**
Nitrogen:	81.0	**%**

MOISTURE DETERMINATION

Initial Impinger Content:	3874.20	**mls.**
Final Impinger Content:	3934.80	**mls.**
Difference:	60.60	
Silica Initial Wt.	0.00	**grams**
Silica Final Wt.	0.00	**grams**
Difference:	0.00	
Total Water Gain:	60.60	

STACK PARAMETERS

Delta H:	1.40	**Inches H_2O**
Meter Temperature, Tm:	64.2	**°F**
Sqrt ΔP:	0.510	**Inches H_2O**
Stack Temperature, Ts:	329.0	**°F**
Meter Volume, Vm:	44.404	**Cubic Feet**
Meter Volume, Vmstd:	43.182	**dscf**
Meter Volume, Vwstd:	2.854	**wscf**
Moisture, Bws:	0.062	
Meter Volume, Normal	40.239	

Gas Weight dry, Md:	30.200	**lb/lb mole**
Gas Weight wet, Ms:	29.444	**lb/lb mole**
Excess Air:	48.665	**%**
Gas Velocity, Vs:	35.695	
Volumetric Flow, ACFM:	1,285,028	
Volumetric Flow, DSCFM:	759,302	
Volumetric Flow, SCFM:	809,490	
Isokinetic Variance, %I:	97.6	

EMISSION DATA

Type of Fuel Firing:	Coal
Fuel Factor F_d (dscf/mmBtu):	9780
List Mol. Wt. of Analyte if ppm needed:	36.461

Sample ID:	**Filterable**
Item:	**Filter**
PM, grams (net) collected:	0.0135
PM, grains/acf:	0.003
PM, grains/dscf:	0.005
mg/dncm:	11.8480
PM, lb/hr:	31.395
PM lb/mmBtu (based on Fd):	0.010

36.461

HCl		
mg (net) collected:	168.00	---
ppm:	90.57	---
ug/dncm:	147441.62	---
lb/hr:	390.7526	---
lb/mmBtu (based on Fd):	0.12613	---

80.917

HBr		
mg (net) collected:	1.93	---
ppm:	0.47	---
ug/dncm:	1693.82	---
lb/hr:	4.4890	---
lb/mmBtu (based on Fd):	0.00145	---

20.006

HF		
mg (net) collected:	3.72	---
ppm:	3.65	---
ug/dncm:	3264.78	---
lb/hr:	8.6524	---
lb/mmBtu (based on Fd):	0.00279	---

70.906

Cl_2		
mg (net) collected:	4.77	---
ppm:	1.32	---
ug/dncm:	4186.29	---
lb/hr:	11.0946	---
lb/mmBtu (based on Fd):	0.00358	---

159.818

Br_2		
mg (net) collected:	0.20	---
ppm:	0.02	---
ug/dncm:	175.53	---
lb/hr:	0.4652	---
lb/mmBtu (based on Fd):	0.00015	---

TRAVERSE DATA: Method 5/26A

Company: ADA
Plant: AEP Conesville
Location: Unit 6 ESP Outlet

Test Run: 3 **Test Date:** 3/14/2006
Start Time: 14:35
End Time: 15:39

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	14:35:00	0.27	1.40	52.54	0.520	324	63	61	4.0	5.494	36.22
1-2	14:42:30	0.25	1.40	58.03	0.500	325	61	66	4.0	5.460	34.87
	14:50:00			63.49							
2-1	14:50:00	0.24	1.30	63.49	0.490	340	68	62	3.0	5.400	34.49
2-2	14:57:30	0.24	1.30	68.89	0.490	340	67	62	3.0	5.470	34.49
	15:05:00			74.36							
3-1	15:09:00	0.28	1.50	75.42	0.529	323	67	62	4.0	5.730	36.86
3-2	15:16:30	0.24	1.30	81.15	0.490	327	67	62	4.0	5.340	34.21
	15:24:00			86.49							
4-1	15:24:00	0.28	1.50	86.49	0.529	327	67	62	4.0	5.760	36.95
4-2	15:31:30	0.28	1.50	92.25	0.529	326	68	62	4.0	5.750	36.93
	15:39:00			98.00							
			1.40	44.404	0.510	329	66	62		44.404	
							64.19				

Field Notes/Comments:

TEST DATA	- Method 5/26A	Run No.: 4

Project Number: PE2006043 **Test Date:** 3/14/2006

TEST PARAMETERS

Company:	ADA	
Plant:	AEP Conesville	
Test Location:	Unit 6 ESP Outlet	
Source Condition:	Normal	
Test Engineer:	JLH	
Temp ID:	CM-9	
Meter ID:	CM-9	
Meter Calibration Factor:	0.996	
Pitot ID:	005A	
Pitot Tube Coefficient:	0.840	
Probe Length:	10.0	**ft.**
Probe Liner Material:	Glass	
Nozzle Diameter:	0.327	**in.**
Train Type:	Hot Box	

Duct Shape:	Rectangular	
Length:	15.00	**Feet**
Width:	40.00	**Feet**
Duct Area:	600.000	**Sq. Ft.**
Sample Plane:	Vertical	
Port Length:		**in.**
Port Size (diameter):	4.00	**in.**
Port Type:	Flange	
Number of Ports Sampled:	4	
Number of Points per Port:	2	
Minutes per Point:	7.5	
Total Number of Traverse Points:	8	
Test Length:	60	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	28.90	**in. Hg.**
Static Pressure:	-10.00	**in. H_2O**
Flue Pressure (Ps):	28.16	**in. Hg. abs.**
Sample Train Leak Check Pre:	0.002	
Post:	0.010	
@	10/6	**in. Hg.**
Carbon Dioxide:	12.0	**%**
Oxygen:	7.0	**%**
Nitrogen:	81.0	**%**

MOISTURE DETERMINATION

Final Impinger Content:	3740.40	**mls.**
Initial Impinger Content:	3691.80	**mls.**
Difference:	48.60	
Silica Final Wt.	0.00	**grams**
Silica Initial Wt.	0.00	**grams**
Difference:	0.00	
Total Water Gain:	48.60	

STACK PARAMETERS

Delta H:	1.48	**Inches H_2O**
Meter Temperature, Tm:	63.3	**°F**
Sqrt ΔP:	0.524	**Inches H_2O**
Stack Temperature, Ts:	331.3	**°F**
Meter Volume, Vm:	45.970	**Cubic Feet**
Meter Volume, Vmstd:	44.794	**dscf**
Meter Volume, Vwstd:	2.289	**wscf**
Moisture, Bws:	0.049	
Meter Volume, Normal	41.740	

Gas Weight dry, Md:	30.200	**lb/lb mole**
Gas Weight wet, Ms:	29.607	**lb/lb mole**
Excess Air:	48.665	**%**
Gas Velocity, Vs:	36.652	
Volumetric Flow, ACFM:	1,319,479	
Volumetric Flow, DSCFM:	788,533	
Volumetric Flow, SCFM:	828,829	
Isokinetic Variance, %I:	97.5	

EMISSION DATA

Type of Fuel Firing:	Coal
Fuel Factor F_d (dscf/mmBtu):	9780
List Mol. Wt. of Analyte if ppm needed:	36.461

Sample ID:	**Filterable**
Item:	**Filter**
PM, grams (net) collected:	0.0216
PM, grains/acf:	0.004
PM, grains/dscf:	0.007
mg/dncm:	18.2748
PM, lb/hr:	50.289
PM lb/mmBtu (based on Fd):	0.016

36.461

HCl		
mg (net) collected:	115.00	---
ppm:	59.76	---
ug/dncm:	97296.29	---
lb/hr:	267.7832	---
lb/mmBtu (based on Fd):	0.08323	---

HBr		
mg (net) collected:	1.14	---
ppm:	0.27	---
ug/dncm:	964.50	---
lb/hr:	2.6545	---
lb/mmBtu (based on Fd):	0.00083	---

20.006

HF		
mg (net) collected:	2.50	---
ppm:	2.37	---
ug/dncm:	2115.14	---
lb/hr:	5.8214	---
lb/mmBtu (based on Fd):	0.00181	---

Cl_2		
mg (net) collected:	2.52	---
ppm:	0.67	---
ug/dncm:	2132.06	---
lb/hr:	5.8679	---
lb/mmBtu (based on Fd):	0.00182	---

159.818

Br_2		
mg (net) collected:	0.20	---
ppm:	0.02	---
ug/dncm:	169.21	---
lb/hr:	0.4657	---
lb/mmBtu (based on Fd):	0.00014	---

TRAVERSE DATA: Method 5/26A

Company: ADA
Plant: AEP Conesville
Location: Unit 6 ESP Outlet

Test Run: 4
Start Time: 16:20
End Time: 17:25
Test Date: 3/14/2006

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	16:20:00	0.28	1.50	11.55	0.529	324	64	62	5.0	5.800	36.88
1-2	16:27:30	0.24	1.30	17.35	0.490	326	66	62	4.0	5.400	34.19
	16:35:00			22.75							
2-1	16:35:00	0.30	1.60	22.75	0.548	326	67	62	4.0	5.950	38.23
2-2	16:42:30	0.28	1.50	28.70	0.529	326	66	61	4.0	5.800	36.93
	16:50:00			34.50							
3-1	16:55:00	0.24	1.30	35.00	0.490	330	64	61	5.0	5.360	34.28
3-2	17:02:30	0.29	1.50	40.36	0.539	340	65	60	5.0	5.940	37.92
	17:10:00			46.30							
4-1	17:10:00	0.30	1.60	46.30	0.548	339	66	60	5.0	6.000	38.54
4-2	17:17:30	0.27	1.50	52.30	0.520	339	66	60	5.0	5.720	36.56
	17:25:00			58.02							
			1.48	45.970	0.524	331	66	61		45.970	
							63.25				

Field Notes/Comments:

TEST DATA	- Method 17/26A	Run No.: 1

Project Number: PE2006043 **Test Date:** 3/14/2006

TEST PARAMETERS

Company:	ADA	
Plant:	AEP Conesville	
Test Location:	Unit 6 ESP Inlet	
Source Condition:	Normal	
Test Engineer:	CT	
Temp ID:	CM-7	
Meter ID:	CM-7	
Meter Calibration Factor:	1.006	
Pitot ID:		
Pitot Tube Coefficient:	0.840	
Probe Length:	10.0	**ft.**
Probe Liner Material:	Teflon	
Nozzle Diameter:	0.318	**in.**
Train Type:	Other	

Duct Shape:	Rectangular	
Length:	17.75	**Feet**
Width:	43.50	**Feet**
Duct Area:	772.125	**Sq. Ft.**
Sample Plane:	Horizontal	
Port Length:	18.00	**in.**
Port Size (diameter):	4.00	**in.**
Port Type:	Flange	
Number of Ports Sampled:	6	
Number of Points per Port:	2	
Minutes per Point:	5.0	
Total Number of Traverse Points:	12	
Test Length:	60	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	28.90	**in. Hg.**
Static Pressure:	-12.00	**in. H_2O**
Flue Pressure (Ps):	28.02	**in. Hg. abs.**
Sample Train Leak Check Pre:	0.000	
Post:	0.000	
@	10/10	**in. Hg.**
Carbon Dioxide:	13.0	**%**
Oxygen:	6.0	**%**
Nitrogen:	81.0	**%**

MOISTURE DETERMINATION

Initial Impinger Content:	2955.20	**mls.**
Final Impinger Content:	3006.80	**mls.**
Difference:	51.60	
Silica Initial Wt.	0.00	**grams**
Silica Final Wt.	0.00	**grams**
Difference:	0.00	
Total Water Gain:	51.60	

STACK PARAMETERS

Delta H:	1.49	**Inches H_2O**
Meter Temperature, Tm:	61.3	**°F**
Sqrt ΔP:	0.557	**Inches H_2O**
Stack Temperature, Ts:	329.6	**°F**
Meter Volume, Vm:	45.807	**Cubic Feet**
Meter Volume, Vmstd:	45.258	**dscf**
Meter Volume, Vwstd:	2.430	**wscf**
Moisture, Bws:	0.051	
Meter Volume, Normal	42.173	

Gas Weight dry, Md:	30.320	**lb/lb mole**
Gas Weight wet, Ms:	29.692	**lb/lb mole**
Excess Air:	39.002	**%**
Gas Velocity, Vs:	38.992	
Volumetric Flow, ACFM:	1,806,379	
Volumetric Flow, DSCFM:	1,073,487	
Volumetric Flow, SCFM:	1,131,133	
Isokinetic Variance, %I:	98.4	

EMISSION DATA

Type of Fuel Firing:	Coal
Fuel Factor F_d (dscf/mmBtu):	9780
List Mol. Wt. of Analyte if ppm needed:	36.461

	Filterable
Sample ID:	
Item:	**Filter**
PM, grams (net) collected:	7.3139
PM, grains/acf:	1.482
PM, grains/dscf:	2.494
mg/dncm:	6124.4901
PM, lb/hr:	22943.895
PM lb/mmBtu (based on Fd):	4.887

36.461

HCl		
mg (net) collected:	28.50	---
ppm:	14.66	---
ug/dncm:	23865.24	---
lb/hr:	89.4189	---
lb/mmBtu (based on Fd):	0.01904	---

HBr		
mg (net) collected:	1.16	---
ppm:	0.27	---
ug/dncm:	971.36	---
lb/hr:	3.6395	---
lb/mmBtu (based on Fd):	0.00078	---

20.006

HF		
mg (net) collected:	0.94	---
ppm:	0.88	---
ug/dncm:	787.13	---
lb/hr:	2.9493	---
lb/mmBtu (based on Fd):	0.00063	---

70.906

Cl_2		
mg (net) collected:	117.00	---
ppm:	30.95	---
ug/dncm:	97973.08	---
lb/hr:	367.0881	---
lb/mmBtu (based on Fd):	0.07818	---

159.818

Br_2		
mg (net) collected:	2.40	---
ppm:	0.28	---
ug/dncm:	2009.70	---
lb/hr:	7.5300	---
lb/mmBtu (based on Fd):	0.00160	---

TRAVERSE DATA: Method 17/26A

Company: ADA
Plant: AEP Conesville
Location: Unit 6 ESP Inlet

Test Run: 1 **Test Date:** 3/14/2006
Start Time: 10:00
End Time: 11:08

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	10:00:00	0.28	1.33	43.41	0.529	350	60	58	3.0	3.606	37.50
1-2	10:05:00	0.38	1.81	47.02	0.616	365	58	58	3.0	4.240	44.08
	10:10:00			51.26							
2-1	10:12:00	0.34	1.62	51.38	0.583	346	59	58	3.0	3.990	41.22
2-2	10:17:00	0.36	1.81	55.37	0.600	355	62	58	4.0	4.110	42.65
	10:22:00			59.48							
4-1	10:25:00	0.31	1.48	59.54	0.557	321	64	58	4.0	3.810	38.74
4-2	10:30:00	0.28	1.33	63.35	0.529	325	65	59	4.0	3.620	36.91
	10:35:00			66.97							
4-1	10:36:00	0.31	1.48	67.04	0.557	325	65	59	4.0	3.810	38.84
4-2	10:41:00	0.28	1.33	70.85	0.529	328	66	59	4.0	3.620	36.98
	10:46:00			74.47							
5-1	10:47:00	0.29	1.38	74.56	0.539	314	66	59	4.0	3.690	37.30
5-2	10:52:00	0.33	1.57	78.25	0.574	311	66	59	4.0	3.940	39.71
	10:57:00			82.19							
6-1	10:58:00	0.25	1.19	82.28	0.500	308	67	60	4.0	3.430	34.50
6-2	11:03:00	0.33	1.57	85.71	0.574	307	67	60	4.0	3.941	39.61
	11:08:00			89.65							
			1.49	45.807	0.557	330	64	59		45.807	
							61.25				

Field Notes/Comments:

TEST DATA	- Method 17/26A	Run No.: 3

Project Number: PE2006043 **Test Date:** 3/14/2006

TEST PARAMETERS

Company:	ADA	
Plant:	AEP Conesville	
Test Location:	Unit 6 ESP Inlet	
Source Condition:	Normal	
Test Engineer:	CT	
Temp ID:	CM-7	
Meter ID:	CM-7	
Meter Calibration Factor:	1.006	
Pitot ID:		
Pitot Tube Coefficient:	0.840	
Probe Length:	10.0	**ft.**
Probe Liner Material:	Teflon	
Nozzle Diameter:	0.318	**in.**
Train Type:	Other	

Duct Shape:	Rectangular	
Length:	17.75	**Feet**
Width:	43.50	**Feet**
Duct Area:	772.125	**Sq. Ft.**
Sample Plane:	Horizontal	
Port Length:	18.00	**in.**
Port Size (diameter):	4.00	**in.**
Port Type:	Flange	
Number of Ports Sampled:	6	
Number of Points per Port:	2	
Minutes per Point:	5.0	
Total Number of Traverse Points:	12	
Test Length:	60	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	28.90	**in. Hg.**
Static Pressure:	-10.00	**in. H_2O**
Flue Pressure (Ps):	28.16	**in. Hg. abs.**
Sample Train Leak Check Pre:	0.000	
Post:	0.000	
@	10/10	**in. Hg.**
Carbon Dioxide:	13.0	**%**
Oxygen:	6.0	**%**
Nitrogen:	81.0	**%**

MOISTURE DETERMINATION

Initial Impinger Content:	3532.60	**mls.**
Final Impinger Content:	3604.40	**mls.**
Difference:	71.80	
Silica Initial Wt.	0.00	**grams**
Silica Final Wt.	0.00	**grams**
Difference:	0.00	
Total Water Gain:	71.80	

STACK PARAMETERS

Delta H:	1.48	**Inches H_2O**
Meter Temperature, Tm:	65.5	**°F**
Sqrt ΔP:	0.552	**Inches H_2O**
Stack Temperature, Ts:	331.2	**°F**
Meter Volume, Vm:	45.348	**Cubic Feet**
Meter Volume, Vmstd:	44.438	**dscf**
Meter Volume, Vwstd:	3.382	**wscf**
Moisture, Bws:	0.071	
Meter Volume, Normal	41.409	

Gas Weight dry, Md:	30.320	**lb/lb mole**
Gas Weight wet, Ms:	29.449	**lb/lb mole**
Excess Air:	39.002	**%**
Gas Velocity, Vs:	38.704	
Volumetric Flow, ACFM:	1,793,056	
Volumetric Flow, DSCFM:	1,046,764	
Volumetric Flow, SCFM:	1,126,424	
Isokinetic Variance, %I:	99.1	

EMISSION DATA

Type of Fuel Firing:	Coal
Fuel Factor F_d (dscf/mmBtu):	9780
List Mol. Wt. of Analyte if ppm needed:	36.461

	Filterable
Sample ID:	
Item:	**Filter**
PM, grams (net) collected:	7.3530
PM, grains/acf:	1.490
PM, grains/dscf:	2.553
mg/dncm:	6270.8807
PM, lb/hr:	22907.520
PM lb/mmBtu (based on Fd):	5.004

36.461

HCl		
mg (net) collected:	117.00	---
ppm:	61.29	---
ug/dncm:	99781.45	---
lb/hr:	364.5572	---
lb/mmBtu (based on Fd):	0.07963	---

80.917

HBr		
mg (net) collected:	2.25	---
ppm:	0.53	---
ug/dncm:	1918.87	---
lb/hr:	7.0107	---
lb/mmBtu (based on Fd):	0.00153	---

20.006

HF		
mg (net) collected:	2.41	---
ppm:	2.30	---
ug/dncm:	2055.33	---
lb/hr:	7.5093	---
lb/mmBtu (based on Fd):	0.00164	---

70.906

Cl_2		
mg (net) collected:	0.10	---
ppm:	0.03	---
ug/dncm:	85.28	---
lb/hr:	0.3116	---
lb/mmBtu (based on Fd):	0.00007	---

159.818

Br_2		
mg (net) collected:	0.20	---
ppm:	0.02	---
ug/dncm:	170.57	---
lb/hr:	0.6232	---
lb/mmBtu (based on Fd):	0.00014	---

TRAVERSE DATA: Method 17/26A

Company: ADA
Plant: AEP Conesville
Location: Unit 6 ESP Inlet

Test Run: 3 **Test Date:** 3/14/2006
Start Time: 14:25
End Time: 15:30

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	14:25:00	0.24	1.16	71.63	0.490	361	64	62	5.0	3.355	34.95
1-2	14:30:00	0.35	1.70	74.98	0.592	367	66	62	5.0	4.050	42.36
	14:35:00			79.03							
2-1	14:36:00	0.24	1.16	79.07	0.490	353	68	62	5.0	3.360	34.78
2-2	14:41:00	0.33	1.60	82.43	0.574	358	69	62	5.0	3.940	40.91
	14:46:00			86.37							
4-1	14:47:00	0.31	1.50	86.43	0.557	323	69	62	5.0	3.780	38.79
4-2	14:52:00	0.30	1.46	90.21	0.548	323	69	62	5.0	3.780	38.16
	14:57:00			93.99							
4-1	14:58:00	0.32	1.55	94.05	0.566	323	69	62	5.0	3.860	39.41
4-2	15:03:00	0.30	1.46	97.91	0.548	324	70	63	5.0	3.760	38.18
	15:08:00			101.67							
5-1	15:09:00	0.28	1.36	101.75	0.529	314	70	63	5.0	3.630	36.65
5-2	15:14:00	0.36	1.75	105.38	0.600	322	70	63	5.0	4.100	41.77
	15:19:00			109.48							
6-1	15:20:00	0.28	1.36	109.52	0.529	300	70	63	5.0	3.620	36.32
6-2	15:25:00	0.36	1.75	113.14	0.600	306	70	63	5.0	4.113	41.35
	15:30:00			117.25							
			1.48	45.348	0.552	331	69	62		45.348	
							65.54				

Field Notes/Comments:

TEST DATA	- Method 17/26A	Run No.: 4

Project Number: PE2006043 **Test Date:** 3/14/2006

TEST PARAMETERS

Company:	ADA	
Plant:	AEP Conesville	
Test Location:	Unit 6 ESP Inlet	
Source Condition:	Normal	
Test Engineer:	CT	
Temp ID:	CM-7	
Meter ID:	CM-7	
Meter Calibration Factor:	1.006	
Pitot ID:		
Pitot Tube Coefficient:	0.840	
Probe Length:	10.0	ft.
Probe Liner Material:	Teflon	
Nozzle Diameter:	0.318	in.
Train Type:	Other	

Duct Shape:	Rectangular	
Length:	17.75	Feet
Width:	43.50	Feet
Duct Area:	772.125	Sq. Ft.
Sample Plane:	Horizontal	
Port Length:	18.00	in.
Port Size (diameter):	4.00	in.
Port Type:	Flange	
Number of Ports Sampled:	6	
Number of Points per Port:	2	
Minutes per Point:	5.0	
Total Number of Traverse Points:	12	
Test Length:	60	min.

STACK CONDITIONS

Barometric Pressure (Pb):	28.90	in. Hg.
Static Pressure:	-10.00	in. H_2O
Flue Pressure (Ps):	28.16	in. Hg. abs.
Sample Train Leak Check Pre:	0.002	
Post:	0.010	
@	10/6	in. Hg.
Carbon Dioxide:	13.0	%
Oxygen:	6.0	%
Nitrogen:	81.0	%

MOISTURE DETERMINATION

Final Impinger Content:	3639.80	mls.
Initial Impinger Content:	3572.20	mls.
Difference:	67.60	
Silica Final Wt.	0.00	grams
Silica Initial Wt.	0.00	grams
Difference:	0.00	
Total Water Gain:	67.60	

STACK PARAMETERS

Delta H:	1.46	Inches H_2O
Meter Temperature, Tm:	67.7	°F
Sqrt ΔP:	0.548	Inches H_2O
Stack Temperature, Ts:	333.3	°F
Meter Volume, Vm:	45.019	Cubic Feet
Meter Volume, Vmstd:	43.936	dscf
Meter Volume, Vwstd:	3.184	wscf
Moisture, Bws:	0.068	
Meter Volume, Normal	40.941	

Gas Weight dry, Md:	30.320	lb/lb mole
Gas Weight wet, Ms:	29.488	lb/lb mole
Excess Air:	39.002	%
Gas Velocity, Vs:	38.451	
Volumetric Flow, ACFM:	1,781,342	
Volumetric Flow, DSCFM:	1,040,708	
Volumetric Flow, SCFM:	1,116,126	
Isokinetic Variance, %I:	98.6	

EMISSION DATA

Type of Fuel Firing:	Coal
Fuel Factor F_d (dscf/mmBtu):	9780
List Mol. Wt. of Analyte if ppm needed:	36.461

	Filterable
Sample ID:	
Item:	Filter
PM, grams (net) collected:	5.0697
PM, grains/acf:	1.040
PM, grains/dscf:	1.780
mg/dncm:	4373.0360
PM, lb/hr:	15882.266
PM lb/mmBtu (based on Fd):	3.489

36.461

HCl		
mg (net) collected:	117.00	---
ppm:	61.99	---
ug/dncm:	100922.19	---
lb/hr:	366.5915	---
lb/mmBtu (based on Fd):	0.08054	---

HBr		
mg (net) collected:	2.30	---
ppm:	0.55	---
ug/dncm:	1983.94	---
lb/hr:	7.2065	---
lb/mmBtu (based on Fd):	0.00158	---

20.006

HF		
mg (net) collected:	2.01	---
ppm:	1.94	---
ug/dncm:	1733.79	---
lb/hr:	6.2979	---
lb/mmBtu (based on Fd):	0.00138	---

Cl_2		
mg (net) collected:	0.57	---
ppm:	0.16	---
ug/dncm:	491.67	---
lb/hr:	1.7860	---
lb/mmBtu (based on Fd):	0.00039	---

159.818

Br_2		
mg (net) collected:	0.20	---
ppm:	0.02	---
ug/dncm:	172.52	---
lb/hr:	0.6267	---
lb/mmBtu (based on Fd):	0.00014	---

TRAVERSE DATA:	**Method 17/26A**

Company: ADA
Plant: AEP Conesville
Location: Unit 6 ESP Inlet

Test Run: 4
Start Time: 16:20
End Time: 17:25
Test Date: 3/14/2006

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	16:20:00	0.25	1.21	18.37	0.500	358	66	64	5.0	3.425	35.60
1-2	16:25:00	0.36	1.75	21.79	0.600	364	66	64	5.0	4.110	42.88
	16:30:00			25.90							
2-1	16:31:00	0.24	1.16	25.98	0.490	354	68	64	5.0	3.360	34.80
2-2	16:36:00	0.31	1.50	29.34	0.557	360	69	64	5.0	3.810	39.70
	16:41:00			33.15							
4-1	16:42:00	0.28	1.36	33.22	0.529	332	70	65	5.0	3.620	37.08
4-2	16:47:00	0.30	1.46	36.84	0.548	333	71	65	5.0	3.750	38.40
	16:52:00			40.59							
4-1	16:53:00	0.30	1.46	40.66	0.548	326	71	65	5.0	3.740	38.23
4-2	16:58:00	0.30	1.46	44.40	0.548	328	72	65	5.0	3.760	38.28
	17:03:00			48.16							
5-1	17:04:00	0.28	1.36	48.23	0.529	317	73	65	5.0	3.620	36.72
5-2	17:09:00	0.38	1.84	51.85	0.616	321	73	66	5.0	4.220	42.89
	17:14:00			56.07							
6-1	17:15:00	0.26	1.26	56.14	0.510	299	73	66	5.0	3.490	34.98
6-2	17:20:00	0.36	1.75	59.63	0.600	307	73	66	5.0	4.114	41.37
	17:25:00			63.74							
			1.46	45.019	0.548	333	70	65		45.019	
							67.67				

Field Notes/Comments:

TEST DATA - Method 29 Run No.: 1

Project Number: PE2006043 **Test Date:** 3/15/2006

TEST PARAMETERS

Company:	ADA		**Duct Shape:**	Rectangular	
Plant:	AEP Conesville		**Length:**	17.75	**Feet**
Test Location:	ESP Inlet		**Width:**	43.50	**Feet**
Source Condition:	Normal		**Duct Area:**	772.125	**Sq. Ft.**
Test Engineer:	CT				
Temp ID:	CM-7		**Sample Plane:**	Horizontal	
Meter ID:	CM-7		**Port Length:**	18.00	**in.**
Meter Calibration Factor:	1.006		**Port Size (diameter):**	4.00	**in.**
Pitot ID:			**Port Type:**	Flange	
Pitot Tube Coefficient:	0.840		**Number of Ports Sampled:**	6	
Probe Length:	10.0	**ft.**	**Number of Points per Port:**	2	
Probe Liner Material:	Teflon		**Minutes per Point:**	7.5	
Nozzle Diameter:	0.318	**in.**	**Total Number of Traverse Points:**	12	
Train Type:	Other		**Test Length:**	90	**min.**

STACK CONDITIONS / MOISTURE DETERMINATION

Barometric Pressure (Pb):	29.15	**in. Hg.**	**Initial Impinger Content:**	4189.80	**mls.**
Static Pressure:	-12.00	**in. H_2O**	**Final Impinger Content:**	4303.80	**mls.**
Flue Pressure (Ps):	28.27	**in. Hg. abs.**	**Difference:**	114.00	
Sample Train Leak Check Pre:	0.000		**Silica Initial Wt.**	0.00	**grams**
Post:	0.000		**Silica Final Wt.**	0.00	**grams**
@	10/10	**in. Hg.**	**Difference:**	0.00	
Carbon Dioxide:	13.0	**%**	**Total Water Gain:**	114.00	
Oxygen:	6.0	**%**			
Nitrogen:	81.0	**%**			

STACK PARAMETERS

Delta H:	1.44	**Inches H_2O**	**Gas Weight dry, Md:**	30.320	**lb/lb mole**
Meter Temperature, Tm:	74.6	**°F**	**Gas Weight wet, Ms:**	29.382	**lb/lb mole**
Sqrt ΔP:	0.544	**Inches H_2O**	**Excess Air:**	39.002	**%**
Stack Temperature, Ts:	332.6	**°F**	**Gas Velocity, Vs:**	38.140	
Meter Volume, Vm:	67.045	**Cubic Feet**	**Volumetric Flow, ACFM:**	1,766,934	
Meter Volume, Vmstd:	65.133	**dscf**	**Volumetric Flow, DSCFM:**	1,027,384	
Meter Volume, Vwstd:	5.369	**wscf**	**Volumetric Flow, SCFM:**	1,112,080	
Moisture, Bws:	0.076		**Isokinetic Variance, %I:**	98.7	
Meter Volume, Normal	60.692				

EMISSION DATA

Type of Fuel Firing: N/A
Fuel Factor F_d (dscf/mmBtu): 9780
List Mol. Wt. of Analyte if ppm needed: 200.590

	Filterable	Condensible
Sample ID:		
Item:	**Filter**	**---**
PM, grams (net) collected:	---	---
PM, grains/acf:	---	---
PM, grains/dscf:	---	---
PM, lb/hr:	---	---
PM lb/mmBtu (based on Fd):	#VALUE!	---
Mercury, Arsenic, and Selenium		
mg (net) collected:	0.03836	---
ppb:	2.49	---
ug/dncm:	22.32	---
lb/hr:	0.0800	---
lb/mmBtu (based on Fd):	0.00002	---

		74.92
Arsenic		
mg (net) collected:	0.07500	---
ppb:	13.05	---
ug/dncm:	43.64	---
lb/hr:	0.1565	---
lb/mmBtu (based on Fd):	0.00003	---

		78.96
Selenium		
mg (net) collected:	0.24800	---
ppb:	40.93	---
ug/dncm:	144.30	---
lb/hr:	0.5175	---
lb/mmBtu (based on Fd):	0.00012	---

TRAVERSE DATA:	**Method 29**

Company: ADA
Plant: AEP Conesville
Location: ESP Inlet

Test Run: 1 **Test Date:** 3/15/2006
Start Time: 8:00
End Time: 9:35

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	8:00:00	0.33	1.60	64.54	0.574	362	64	61	5.0	5.904	41.04
1-2	8:07:30	0.26	1.26	70.44	0.510	360	71	62	5.0	5.240	36.38
	8:15:00			75.68							
2-1	8:16:00	0.25	1.21	75.75	0.500	354	75	65	5.0	5.140	35.55
2-2	8:23:30	0.28	1.36	80.89	0.529	360	76	66	5.0	5.440	37.76
	8:31:00			86.33							
3-1	8:32:00	0.31	1.50	86.38	0.557	330	78	68	5.0	5.700	38.99
3-2	8:39:30	0.29	1.41	92.08	0.539	332	80	70	5.0	5.550	37.76
	8:47:00			97.63							
4-1	8:48:00	0.32	1.55	97.70	0.566	333	83	70	5.0	5.810	39.69
4-2	8:55:30	0.29	1.41	103.51	0.539	330	84	71	5.0	5.530	37.72
	9:03:00			109.04							
5-1	9:04:00	0.27	1.31	109.09	0.520	315	85	73	5.0	5.340	36.04
5-2	9:11:30	0.36	1.75	114.43	0.600	310	86	75	5.0	6.170	41.49
	9:19:00			120.60							
6-1	9:20:00	0.25	1.21	120.67	0.500	299	87	76	5.0	5.140	34.32
6-2	9:27:30	0.35	1.70	125.81	0.592	306	88	77	5.0	6.081	40.80
	9:35:00			131.89							
			1.44	67.045	0.544	333	80	70		67.045	
							74.63				

Field Notes/Comments:

TEST DATA	- Method 29	Run No.: 2

Project Number: PE2006043 **Test Date:** 3/15/2006

TEST PARAMETERS

Company:	ADA		**Duct Shape:**	Rectangular	
Plant:	AEP Conesville		**Length:**	17.75	**Feet**
Test Location:	ESP Inlet		**Width:**	43.50	**Feet**
Source Condition:	Normal		**Duct Area:**	772.125	**Sq. Ft.**
Test Engineer:	CT				
Temp ID:	CM-7		**Sample Plane:**	Horizontal	
Meter ID:	CM-7		**Port Length:**	18.00	**in.**
Meter Calibration Factor:	1.006		**Port Size (diameter):**	4.00	**in.**
Pitot ID:			**Port Type:**	Flange	
Pitot Tube Coefficient:	0.840		**Number of Ports Sampled:**	6	
Probe Length:	10.0	**ft.**	**Number of Points per Port:**	2	
Probe Liner Material:	Teflon		**Minutes per Point:**	7.5	
Nozzle Diameter:	0.318	**in.**	**Total Number of Traverse Points:**	12	
Train Type:	Other		**Test Length:**	90	**min.**

STACK CONDITIONS / **MOISTURE DETERMINATION**

Barometric Pressure (Pb):	29.15	**in. Hg.**	**Initial Impinger Content:**	4198.00	**mls.**
Static Pressure:	-12.00	**in. H_2O**	**Final Impinger Content:**	4280.40	**mls.**
Flue Pressure (Ps):	28.27	**in. Hg. abs.**	**Difference:**	82.40	
Sample Train Leak Check Pre:	0.000		**Silica Initial Wt.**	0.00	**grams**
Post:	0.000		**Silica Final Wt.**	0.00	**grams**
@	10/10	**in. Hg.**	**Difference:**	0.00	
Carbon Dioxide:	13.0	**%**	**Total Water Gain:**	82.40	
Oxygen:	6.0	**%**			
Nitrogen:	81.0	**%**			

STACK PARAMETERS

Delta H:	1.49	**Inches H_2O**	**Gas Weight dry, Md:**	30.320	**lb/lb mole**
Meter Temperature, Tm:	80.0	**°F**	**Gas Weight wet, Ms:**	29.640	**lb/lb mole**
Sqrt ΔP:	0.544	**Inches H_2O**	**Excess Air:**	39.002	**%**
Stack Temperature, Ts:	333.1	**°F**	**Gas Velocity, Vs:**	38.024	
Meter Volume, Vm:	69.069	**Cubic Feet**	**Volumetric Flow, ACFM:**	1,761,539	
Meter Volume, Vmstd:	66.439	**dscf**	**Volumetric Flow, DSCFM:**	1,046,834	
Meter Volume, Vwstd:	3.881	**wscf**	**Volumetric Flow, SCFM:**	1,107,985	
Moisture, Bws:	0.055		**Isokinetic Variance, %I:**	98.8	
Meter Volume, Normal	61.910				

EMISSION DATA

Type of Fuel Firing:	N/A
Fuel Factor F_d (dscf/mmBtu):	9780
List Mol. Wt. of Analyte if ppm needed:	200.590

	Filterable	**Condensible**
Sample ID:		
Item:	**Filter**	---
PM, grams (net) collected:	---	---
PM, grains/acf:	---	---
PM, grains/dscf:	---	---
PM, lb/hr:	---	---
PM lb/mmBtu (based on Fd):	#VALUE!	---
Mercury, Arsenic, and Selenium		
mg (net) collected:	0.0315	---
ppb:	2.00	---
ug/dncm:	17.95	---
lb/hr:	0.0656	---
lb/mmBtu (based on Fd):	0.00001	---

Arsenic		74.92
mg (net) collected:	0.37600	---
ppb:	64.11	---
ug/dncm:	214.48	---
lb/hr:	0.7837	---
lb/mmBtu (based on Fd):	0.00017	---

Selenium		78.96
mg (net) collected:	0.23200	---
ppb:	37.54	---
ug/dncm:	132.34	---
lb/hr:	0.4835	---
lb/mmBtu (based on Fd):	0.00011	---

TRAVERSE DATA: Method 29

Company: ADA
Plant: AEP Conesville
Location: ESP Inlet

Test Run: 2 **Test Date:** 3/15/2006
Start Time: 11:20
End Time: 12:55

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	11:20:00	0.25	1.25	33.95	0.500	362	78	78	5.0	5.287	35.72
1-2	11:27:30	0.36	1.80	39.24	0.600	360	78	78	5.0	6.350	42.81
	11:35:00			45.59							
2-1	11:36:00	0.24	1.20	45.66	0.490	355	79	78	5.0	5.180	34.85
2-2	11:43:30	0.31	1.55	50.84	0.557	362	79	79	5.0	5.890	39.78
	11:51:00			56.73							
3-1	11:52:00	0.30	1.50	56.80	0.548	331	80	79	5.0	5.790	38.38
3-2	11:59:30	0.27	1.35	62.59	0.520	330	80	79	5.0	5.490	36.39
	12:07:00			68.08							
4-1	12:08:00	0.31	1.55	68.15	0.557	325	81	80	5.0	5.890	38.87
4-2	12:15:30	0.28	1.40	74.04	0.529	330	81	80	5.0	5.600	37.06
	12:23:00			79.64							
5-1	12:24:00	0.27	1.35	79.71	0.520	318	82	80	5.0	5.490	36.11
5-2	12:31:30	0.36	1.80	85.20	0.600	314	82	81	5.0	6.350	41.59
	12:39:00			91.55							
6-1	12:40:00	0.27	1.35	91.61	0.520	303	83	81	5.0	5.490	35.76
6-2	12:47:30	0.35	1.75	97.10	0.592	307	83	81	5.0	6.262	40.83
	12:55:00			103.36							
			1.49	69.069	0.544	333	81	80		69.069	
							80.00				

Field Notes/Comments:

TEST DATA	- Method 29	Run No.: 3

Project Number: PE2006043 **Test Date:** 3/15/2006

TEST PARAMETERS

Company:	ADA	
Plant:	AEP Conesville	
Test Location:	ESP Inlet	
Source Condition:	Normal	
Test Engineer:	CT	
Temp ID:	CM-7	
Meter ID:	CM-7	
Meter Calibration Factor:	1.006	
Pitot ID:		
Pitot Tube Coefficient:	0.840	
Probe Length:	10.0	**ft.**
Probe Liner Material:	Teflon	
Nozzle Diameter:	0.318	**in.**
Train Type:	Other	

Duct Shape:	Rectangular	
Length:	17.75	**Feet**
Width:	43.50	**Feet**
Duct Area:	772.125	**Sq. Ft.**
Sample Plane:	Horizontal	
Port Length:	18.00	**in.**
Port Size (diameter):	4.00	**in.**
Port Type:	Flange	
Number of Ports Sampled:	6	
Number of Points per Port:	2	
Minutes per Point:	7.5	
Total Number of Traverse Points:	12	
Test Length:	90	**min.**

STACK CONDITIONS

Barometric Pressure (Pb):	29.15	**in. Hg.**
Static Pressure:	-12.00	**in. H_2O**
Flue Pressure (Ps):	28.27	**in. Hg. abs.**
Sample Train Leak Check Pre:	0.000	
Post:	0.000	
@	10/10	**in. Hg.**
Carbon Dioxide:	13.0	**%**
Oxygen:	6.0	**%**
Nitrogen:	81.0	**%**

MOISTURE DETERMINATION

Initial Impinger Content:	4492.00	**mls.**
Final Impinger Content:	4597.80	**mls.**
Difference:	105.80	
Silica Initial Wt.	0.00	**grams**
Silica Final Wt.	0.00	**grams**
Difference:	0.00	
Total Water Gain:	105.80	

STACK PARAMETERS

Delta H:	1.49	**Inches H_2O**
Meter Temperature, Tm:	85.0	**°F**
Sqrt ΔP:	0.544	**Inches H_2O**
Stack Temperature, Ts:	332.3	**°F**
Meter Volume, Vm:	69.095	**Cubic Feet**
Meter Volume, Vmstd:	65.854	**dscf**
Meter Volume, Vwstd:	4.983	**wscf**
Moisture, Bws:	0.070	
Meter Volume, Normal	61.365	

Gas Weight dry, Md:	30.320	**lb/lb mole**
Gas Weight wet, Ms:	29.453	**lb/lb mole**
Excess Air:	39.002	**%**
Gas Velocity, Vs:	38.129	
Volumetric Flow, ACFM:	1,766,422	
Volumetric Flow, DSCFM:	1,033,984	
Volumetric Flow, SCFM:	1,112,225	
Isokinetic Variance, %I:	99.1	

EMISSION DATA

Type of Fuel Firing: N/A
Fuel Factor F_d (dscf/mmBtu): 9780
List Mol. Wt. of Analyte if ppm needed: 200.590

	Filterable	Condensible
Sample ID:		
Item:	Filter	---
PM, grams (net) collected:	---	---
PM, grains/acf:	---	---
PM, grains/dscf:	---	---
PM, lb/hr:	---	---
PM lb/mmBtu (based on Fd):	#VALUE!	---
Mercury, Arsenic, and Selenium		
mg (net) collected:	0.03399	---
ppb:	2.18	---
ug/dncm:	19.56	---
lb/hr:	0.0706	---
lb/mmBtu (based on Fd):	0.00002	---

74.92

Arsenic		
mg (net) collected:	0.31170	---
ppb:	53.62	---
ug/dncm:	179.38	---
lb/hr:	0.6474	---
lb/mmBtu (based on Fd):	0.00014	---

78.96

Selenium		
mg (net) collected:	1.21500	---
ppb:	198.32	---
ug/dncm:	699.22	---
lb/hr:	2.5234	---
lb/mmBtu (based on Fd):	0.00056	---

TRAVERSE DATA: Method 29

Company: ADA
Plant: AEP Conesville
Location: ESP Inlet

Test Run: 3 **Test Date:** 3/15/2006
Start Time: 16:15
End Time: 17:50

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	16:15:00	0.25	1.25	70.46	0.500	352	83	83	5.0	5.292	35.50
1-2	16:22:30	0.34	1.70	75.75	0.583	366	83	83	5.0	6.170	41.76
	16:30:00			81.92							
2-1	16:31:00	0.25	1.25	81.99	0.500	358	84	83	5.0	5.290	35.63
2-2	16:38:30	0.29	1.45	87.28	0.539	362	84	84	5.0	5.690	38.47
	16:46:00			92.97							
3-1	16:47:00	0.31	1.55	93.04	0.557	330	85	84	5.0	5.890	38.99
3-2	16:54:30	0.30	1.50	98.93	0.548	330	85	84	5.0	5.790	38.36
	17:02:00			104.72							
4-1	17:03:00	0.31	1.55	104.77	0.557	331	86	85	5.0	5.890	39.02
4-2	17:10:30	0.28	1.40	110.66	0.529	330	86	85	5.0	5.600	37.06
	17:18:00			116.26							
5-1	17:19:00	0.27	1.35	116.31	0.520	312	87	85	5.0	5.490	35.98
5-2	17:26:30	0.36	1.80	121.80	0.600	310	87	86	5.0	6.350	41.49
	17:34:00			128.15							
6-1	17:35:00	0.25	1.25	128.22	0.500	299	88	86	5.0	5.290	34.32
6-2	17:42:30	0.36	1.80	133.51	0.600	307	88	86	5.0	6.353	41.41
	17:50:00			139.86							
			1.49	69.095	0.544	332	86	85		69.095	
							85.00				

Field Notes/Comments:

TEST DATA	- Method 29	Run No.: 1

Project Number: PE2006043 **Test Date:** 3/15/2006

TEST PARAMETERS

Company:	ADA		**Duct Shape:**	Rectangular	
Plant:	AEP Conesville		**Length:**	15.00	**Feet**
Test Location:	ESP Outlet		**Width:**	40.00	**Feet**
Source Condition:	Normal		**Duct Area:**	600.000	**Sq. Ft.**
Test Engineer:	JLH				
Temp ID:	CM-9		**Sample Plane:**	Vertical	
Meter ID:	CM-9		**Port Length:**		**in.**
Meter Calibration Factor:	0.960		**Port Size (diameter):**	4.00	**in.**
Pitot ID:	005A		**Port Type:**	Flange	
Pitot Tube Coefficient:	0.840		**Number of Ports Sampled:**	1	
Probe Length:	10.0	**ft.**	**Number of Points per Port:**	1	
Probe Liner Material:	Glass		**Minutes per Point:**	5.0	
Nozzle Diameter:	0.327	**in.**	**Total Number of Traverse Points:**	1	
Train Type:	Hot Box		**Test Length:**	90	**min.**

STACK CONDITIONS / MOISTURE DETERMINATION

Barometric Pressure (Pb):	29.15	**in. Hg.**	**Initial Impinger Content:**	4457.80	**mls.**
Static Pressure:	-10.00	**in. H_2O**	**Final Impinger Content:**	4569.40	**mls.**
Flue Pressure (Ps):	28.41	**in. Hg. abs.**	**Difference:**	111.60	
Sample Train Leak Check Pre:	0.005		**Silica Initial Wt.**	0.00	**grams**
Post:	0.010		**Silica Final Wt.**	0.00	**grams**
@	10/7	**in. Hg.**	**Difference:**	0.00	
Carbon Dioxide:	12.0	**%**	**Total Water Gain:**	111.60	
Oxygen:	7.0	**%**			
Nitrogen:	81.0	**%**			

STACK PARAMETERS

Delta H:	1.31	**Inches H_2O**	**Gas Weight dry, Md:**	30.200	**lb/lb mole**
Meter Temperature, Tm:	52.5	**°F**	**Gas Weight wet, Ms:**	29.249	**lb/lb mole**
Sqrt ΔP:	0.501	**Inches H_2O**	**Excess Air:**	48.665	**%**
Stack Temperature, Ts:	328.7	**°F**	**Gas Velocity, Vs:**	35.016	
Meter Volume, Vm:	64.290	**Cubic Feet**	**Volumetric Flow, ACFM:**	1,260,587	
Meter Volume, Vmstd:	62.149	**dscf**	**Volumetric Flow, DSCFM:**	738,929	
Meter Volume, Vwstd:	5.256	**wscf**	**Volumetric Flow, SCFM:**	801,425	
Moisture, Bws:	0.078		**Isokinetic Variance, %I:**	96.2	
Meter Volume, Normal	57.912				

EMISSION DATA

Type of Fuel Firing: N/A
Fuel Factor F_d (dscf/mmBtu): 9780
List Mol. Wt. of Analyte if ppm needed: 200.590

	Filterable	Condensible
Sample ID:		
Item:	Filter	---
PM, grams (net) collected:	---	---
PM, grains/acf:	---	---
PM, grains/dscf:	---	---
PM, lb/hr:	---	---
PM lb/mmBtu (based on Fd):	#VALUE!	---
Mercury, Arsenic, and Selenium		
mg (net) collected:	0.04332	---
ppb:	2.95	---
ug/dncm:	26.42	---
lb/hr:	0.0681	---
lb/mmBtu (based on Fd):	0.00002	---

Arsenic		
mg (net) collected:	0.07100	---
ppb:	4.83	---
ug/dncm:	43.30	---
lb/hr:	0.1117	---
lb/mmBtu (based on Fd):	0.00004	---

Selenium		
mg (net) collected:	0.27900	---
ppb:	19.00	---
ug/dncm:	170.13	---
lb/hr:	0.4388	---
lb/mmBtu (based on Fd):	0.00015	---

TRAVERSE DATA: Method 29

Company: ADA
Plant: AEP Conesville
Location: ESP Outlet

Test Run: 1
Start Time: 8:00
End Time: 9:30
Test Date: 3/15/2006

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	8:00:00	0.24	1.20	69.70	0.490	317	48	46	5.0	3.468	34.02
1-1	8:05:00	0.25	1.30	73.17	0.500	329	51	47	5.0	3.030	34.98
1-1	8:10:00	0.25	1.30	76.20	0.500	329	53	47	5.0	4.070	34.98
1-1	8:15:00	0.25	1.30	80.27	0.500	329	54	47	5.0	3.570	34.98
1-1	8:20:00	0.25	1.30	83.84	0.500	331	55	48	6.0	3.560	35.03
1-1	8:25:00	0.25	1.30	87.40	0.500	330	56	49	6.0	3.570	35.01
1-1	8:30:00	0.26	1.40	90.97	0.510	330	57	49	6.0	3.640	35.70
1-1	8:35:00	0.26	1.40	94.61	0.510	330	57	49	6.0	3.630	35.70
1-1	8:40:00	0.25	1.30	98.24	0.500	330	57	50	6.0	3.560	35.01
1-1	8:45:00	0.25	1.30	101.80	0.500	330	57	50	6.0	3.590	35.01
1-1	8:50:00	0.25	1.30	105.39	0.500	320	57	50	6.0	3.610	34.78
1-1	8:55:00	0.25	1.30	109.00	0.500	330	57	50	5.0	3.590	35.01
1-1	9:00:00	0.25	1.30	112.59	0.500	330	57	50	5.0	3.560	35.01
1-1	9:05:00	0.25	1.30	116.15	0.500	331	57	51	5.0	3.670	35.03
1-1	9:10:00	0.25	1.30	119.82	0.500	330	57	51	5.0	3.520	35.01
1-1	9:15:00	0.25	1.30	123.34	0.500	330	58	51	5.0	3.560	35.01
1-1	9:20:00	0.25	1.30	126.90	0.500	331	58	51	5.0	3.520	35.03
1-1	9:25:00	0.25	1.30	130.42	0.500	330	58	51	5.0	3.572	35.01
	9:30:00			133.99							
			1.31	64.290	0.501	329	56	49		64.290	
							52.53				

Field Notes/Comments:

TEST DATA - Method 29 Run No.: 2

Project Number: PE2006043 **Test Date:** 3/15/2006

TEST PARAMETERS

Company:	ADA		**Duct Shape:**	Rectangular	
Plant:	AEP Conesville		**Length:**	15.00	**Feet**
Test Location:	ESP Outlet		**Width:**	40.00	**Feet**
Source Condition:	Normal		**Duct Area:**	600.000	**Sq. Ft.**
Test Engineer:	JLH				
Temp ID:	CM-9		**Sample Plane:**	Vertical	
Meter ID:	CM-9		**Port Length:**		**in.**
Meter Calibration Factor:	0.996		**Port Size (diameter):**	4.00	**in.**
Pitot ID:	005A		**Port Type:**	Flange	
Pitot Tube Coefficient:	0.840		**Number of Ports Sampled:**	1	
Probe Length:	10.0	**ft.**	**Number of Points per Port:**	1	
Probe Liner Material:	Glass		**Minutes per Point:**	5.0	
Nozzle Diameter:	0.327	**in.**	**Total Number of Traverse Points:**	1	
Train Type:	Hot Box		**Test Length:**	90	**min.**

STACK CONDITIONS / MOISTURE DETERMINATION

Barometric Pressure (Pb):	29.15	**in. Hg.**	**Initial Impinger Content:**	4483.20	**mls.**
Static Pressure:	-10.00	**in. H_2O**	**Final Impinger Content:**	4565.20	**mls.**
Flue Pressure (Ps):	28.41	**in. Hg. abs.**	**Difference:**	82.00	
Sample Train Leak Check Pre:	0.003		**Silica Initial Wt.**	0.00	**grams**
Post:	0.008		**Silica Final Wt.**	0.00	**grams**
@	10/6	**in. Hg.**	**Difference:**	0.00	
Carbon Dioxide:	12.0	%	**Total Water Gain:**	82.00	
Oxygen:	7.0	%			
Nitrogen:	81.0	%			

STACK PARAMETERS

Delta H:	1.26	**Inches H_2O**	**Gas Weight dry, Md:**	30.200	**lb/lb mole**
Meter Temperature, Tm:	59.9	**°F**	**Gas Weight wet, Ms:**	29.503	**lb/lb mole**
Sqrt ΔP:	0.485	**Inches H_2O**	**Excess Air:**	48.665	**%**
Stack Temperature, Ts:	328.8	**°F**	**Gas Velocity, Vs:**	33.807	
Meter Volume, Vm:	64.500	**Cubic Feet**	**Volumetric Flow, ACFM:**	1,217,043	
Meter Volume, Vmstd:	63.763	**dscf**	**Volumetric Flow, DSCFM:**	729,449	
Meter Volume, Vwstd:	3.862	**wscf**	**Volumetric Flow, SCFM:**	773,632	
Moisture, Bws:	0.057		**Isokinetic Variance, %I:**	100.0	
Meter Volume, Normal	59.416				

EMISSION DATA

Type of Fuel Firing: N/A
Fuel Factor F_d (dscf/mmBtu): 9780
List Mol. Wt. of Analyte if ppm needed: 200.590

	Filterable	Condensible
Sample ID:		
Item:	Filter	---
PM, grams (net) collected:	---	---
PM, grains/acf:	---	---
PM, grains/dscf:	---	---
PM, lb/hr:	---	---
PM lb/mmBtu (based on Fd):	#VALUE!	---
Mercury, Arsenic, and Selenium		
mg (net) collected:	0.02976	---
ppb:	1.97	---
ug/dncm:	17.69	---
lb/hr:	0.0450	---
lb/mmBtu (based on Fd):	0.00002	---

Arsenic		
mg (net) collected:	0.05450	---
ppb:	3.62	---
ug/dncm:	32.39	---
lb/hr:	0.0825	---
lb/mmBtu (based on Fd):	0.00003	---
Selenium		
mg (net) collected:	0.15300	---
ppb:	10.15	---
ug/dncm:	90.94	---
lb/hr:	0.2315	---
lb/mmBtu (based on Fd):	0.00008	---

TRAVERSE DATA: Method 29

Company: ADA
Plant: AEP Conesville
Location: ESP Outlet

Test Run: 2 **Test Date:** 3/15/2006
Start Time: 11:20
End Time: 12:50

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	11:20:00	0.23	1.20	34.25	0.480	329	56	52	5.0	3.451	33.56
1-1	11:25:00	0.24	1.30	37.70	0.490	329	56	52	5.0	3.524	34.28
1-1	11:30:00	0.24	1.30	41.23	0.490	330	59	53	5.0	3.515	34.30
1-1	11:35:00	0.24	1.30	44.74	0.490	329	60	53	5.0	3.480	34.28
1-1	11:40:00	0.24	1.30	48.22	0.490	330	61	54	5.0	3.510	34.30
1-1	11:45:00	0.24	1.30	51.73	0.490	330	61	54	5.0	3.470	34.30
1-1	11:50:00	0.24	1.30	55.20	0.490	328	62	55	5.0	3.500	34.26
1-1	11:55:00	0.24	1.30	58.70	0.490	330	62	55	5.0	3.580	34.30
1-1	12:00:00	0.24	1.30	62.28	0.490	329	62	55	5.0	3.600	34.28
1-1	12:05:00	0.24	1.30	65.88	0.490	329	63	56	5.0	3.520	34.28
1-1	12:10:00	0.24	1.30	69.40	0.490	329	64	56	5.0	3.500	34.28
1-1	12:15:00	0.23	1.20	72.90	0.480	328	64	57	5.0	3.400	33.53
1-1	12:20:00	0.23	1.20	76.30	0.480	328	66	58	5.0	3.480	33.53
1-1	12:25:00	0.23	1.20	79.78	0.480	329	67	59	5.0	3.520	33.56
1-1	12:30:00	0.23	1.20	83.30	0.480	328	68	61	5.0	3.500	33.53
1-1	12:35:00	0.23	1.20	86.80	0.480	328	68	62	5.0	3.490	33.53
1-1	12:40:00	0.23	1.20	90.29	0.480	327	69	63	5.0	3.410	33.51
1-1	12:45:00	0.23	1.20	93.70	0.480	329	70	64	5.0	5.050	33.56
	12:50:00			98.75							
			1.26	64.500	0.485	329	63	57		64.500	
							59.92				

Field Notes/Comments:

TEST DATA	- Method 29	Run No.: 3

Project Number: PE2006043 **Test Date:** 3/15/2006

TEST PARAMETERS

Company:	ADA		**Duct Shape:**	Rectangular	
Plant:	AEP Conesville		**Length:**	15.00	**Feet**
Test Location:	ESP Outlet		**Width:**	40.00	**Feet**
Source Condition:	Normal		**Duct Area:**	600.000	**Sq. Ft.**
Test Engineer:	JLH				
Temp ID:	CM-9		**Sample Plane:**	Vertical	
Meter ID:	CM-9		**Port Length:**		**in.**
Meter Calibration Factor:	0.996		**Port Size (diameter):**	4.00	**in.**
Pitot ID:	005A		**Port Type:**	Flange	
Pitot Tube Coefficient:	0.840		**Number of Ports Sampled:**	1	
Probe Length:	10.0	**ft.**	**Number of Points per Port:**	1	
Probe Liner Material:	Glass		**Minutes per Point:**	90.0	
Nozzle Diameter:	0.327	**in.**	**Total Number of Traverse Points:**	1	
Train Type:	Hot Box		**Test Length:**	90	**min.**

STACK CONDITIONS / **MOISTURE DETERMINATION**

Barometric Pressure (Pb):	29.15	**in. Hg.**	**Initial Impinger Content:**	4175.20	**mls.**
Static Pressure:	-10.00	**in. H_2O**	**Final Impinger Content:**	4264.80	**mls.**
Flue Pressure (Ps):	28.41	**in. Hg. abs.**	**Difference:**	89.60	
Sample Train Leak Check Pre:	0.005		**Silica Initial Wt.**	0.00	**grams**
Post:	0.006		**Silica Final Wt.**	0.00	**grams**
@	10/5	**in. Hg.**	**Difference:**	0.00	
Carbon Dioxide:	12.0	**%**	**Total Water Gain:**	89.60	
Oxygen:	7.0	**%**			
Nitrogen:	81.0	**%**			

STACK PARAMETERS

Delta H:	1.40	**Inches H_2O**	**Gas Weight dry, Md:**	30.200	**lb/lb mole**
Meter Temperature, Tm:	69.4	**°F**	**Gas Weight wet, Ms:**	29.454	**lb/lb mole**
Sqrt ΔP:	0.501	**Inches H_2O**	**Excess Air:**	48.665	**%**
Stack Temperature, Ts:	330.8	**°F**	**Gas Velocity, Vs:**	34.945	
Meter Volume, Vm:	66.746	**Cubic Feet**	**Volumetric Flow, ACFM:**	1,258,022	
Meter Volume, Vmstd:	64.819	**dscf**	**Volumetric Flow, DSCFM:**	748,953	
Meter Volume, Vwstd:	4.220	**wscf**	**Volumetric Flow, SCFM:**	797,715	
Moisture, Bws:	0.061		**Isokinetic Variance, %I:**	99.0	
Meter Volume, Normal	60.401				

EMISSION DATA

Type of Fuel Firing:	N/A
Fuel Factor F_d (dscf/mmBtu):	9780
List Mol. Wt. of Analyte if ppm needed:	200.590

	Filterable	Condensible
Sample ID:		
Item:	**Filter**	---
PM, grams (net) collected:	---	---
PM, grains/acf:	---	---
PM, grains/dscf:	---	---
PM, lb/hr:	---	---
PM lb/mmBtu (based on Fd):	#VALUE!	---
Mercury, Arsenic, and Selenium		
mg (net) collected:	0.03214	---
ppb:	2.10	---
ug/dncm:	18.79	---
lb/hr:	0.0491	---
lb/mmBtu (based on Fd):	0.00002	---

Arsenic		
mg (net) collected:	0.03680	---
ppb:	2.40	---
ug/dncm:	21.52	---
lb/hr:	0.0562	---
lb/mmBtu (based on Fd):	0.00002	---
Selenium		
mg (net) collected:	0.18100	---
ppb:	11.82	---
ug/dncm:	105.83	---
lb/hr:	0.2766	---
lb/mmBtu (based on Fd):	0.00009	---

TRAVERSE DATA: Method 29

Company: ADA
Plant: AEP Conesville
Location: ESP Outlet

Test Run: 3 **Test Date:** 3/15/2006
Start Time: 16:15
End Time: 17:45

Port-Point No.	Clock Time	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O	Actual Meter Vol. ft^3	Sqrt. Δp	Stack Temp °F	Meter Temp Inlet °F	Meter Temp Outlet °F	Pump Vacuum in. Hg	Collected Vol. ft^3	Point Vel ft/sec
1-1	16:15:00	0.24	1.30	59.75	0.490	318	70	71	7.0	3.628	34.04
1-1	16:20:00	0.24	1.30	63.38	0.490	331	70	72	4.0	3.710	34.32
1-1	16:25:00	0.23	1.30	67.09	0.480	331	73	70	4.0	3.510	33.60
1-1	16:30:00	0.23	1.30	70.60	0.480	331	73	69	4.0	3.550	33.60
1-1	16:35:00	0.23	1.30	74.15	0.480	332	73	69	4.0	3.500	33.62
1-1	16:40:00	0.23	1.30	77.65	0.480	332	73	68	4.0	3.550	33.62
1-1	16:45:00	0.23	1.30	81.20	0.480	332	73	68	4.0	3.550	33.62
1-1	16:50:00	0.23	1.30	84.75	0.480	332	72	67	4.0	3.550	33.62
1-1	16:55:00	0.23	1.30	88.30	0.480	332	72	67	4.0	3.560	33.62
1-1	17:00:00	0.23	1.30	91.86	0.480	332	71	67	4.0	3.520	33.62
1-1	17:05:00	0.27	1.50	95.38	0.520	332	71	66	4.0	3.820	36.43
1-1	17:10:00	0.27	1.50	99.20	0.520	331	71	66	4.0	3.880	36.40
1-1	17:15:00	0.27	1.50	103.08	0.520	332	72	66	4.0	3.900	36.43
1-1	17:20:00	0.27	1.50	106.98	0.520	331	71	65	4.0	3.870	36.40
1-1	17:25:00	0.27	1.50	110.85	0.520	331	71	65	4.0	3.850	36.40
1-1	17:30:00	0.27	1.50	114.70	0.520	331	71	65	4.0	3.860	36.40
1-1	17:35:00	0.29	1.60	118.56	0.539	332	71	65	4.0	3.940	37.75
1-1	17:40:00	0.29	1.60	122.50	0.539	331	71	65	4.0	3.998	37.73
	17:45:00			126.50							
			1.40	66.746	0.501	331	72	67		66.746	
							69.44				

Field Notes/Comments:

METHOD 8A TEST RESULTS

Date:	3/16/2005	Condition:	Normal
Project:	AEP Conesville (ADA)	Data Taken By:	CT
Location:	ESP Inlet	Fuel Factor:	9780
Source:	Unit 6		

Test Number:	1	Time:	15:00-16:00
Pressure, Barometric(Hg"):	29.000	Carbon Dioxide Content(%):	13.00
Pressure, Static(H_2O"):	-12.00	Oxygen Content(%):	6.00
Pressure, Stack(Hg"):	28.117	Nitrogen Content(%):	81.00
Initial Volume (cu.ft.)	77.536	SO_3 (mg)	7.3000
Final Volume (cu.ft.)	98.597		
Meter Temperature (°F)	82.50	Water Vapor in Flue Gas (Bws):	0.064
Meter Volume (dscf)	19.99	SO_3 (ppm)	3.16
Meter Calibration (Y)	1.006		
Initial Wt. (grms or mls)	200.0	SO_3 (lbs/hr)	49.976
Final Wt. (grms or mls)	232.0		
Average Delta H (ΔH)	0.030		
Dry Standard Flow Rate (dscfm):	1,034,503		

Test Number:	2	Time:	16:25-17:25
Pressure, Barometric(Hg"):	29.000	Carbon Dioxide Content(%):	13.00
Pressure, Static(H_2O"):	-12.00	Oxygen Content(%):	6.00
Pressure, Stack(Hg"):	28.117	Nitrogen Content(%):	81.00
Initial Volume (cu.ft.)	98.689	SO_3 (mg)	1.7000
Final Volume (cu.ft.)	120.151		
Meter Temperature (°F)	83.83	Water Vapor in Flue Gas (Bws):	0.064
Meter Volume (dscf)	20.32	SO_3 (ppm)	0.72
Meter Calibration (Y)	1.006		
Initial Wt. (grms or mls)	200.0	SO_3 (lbs/hr)	11.449
Final Wt. (grms or mls)	234.0		
Average Delta H (ΔH)	0.030		
Dry Standard Flow Rate (dscfm):	1,034,503		

Test Number:	3	Time:	17:45-18:45
Pressure, Barometric(Hg"):	29.000	Carbon Dioxide Content(%):	13.00
Pressure, Static(H_2O"):	-12.00	Oxygen Content(%):	6.00
Pressure, Stack(Hg"):	28.117	Nitrogen Content(%):	81.00
Initial Volume (cu.ft.)	120.162	SO_3 (ug)	9.3000
Final Volume (cu.ft.)	141.723		
Meter Temperature (°F)	84.58	Water Vapor in Flue Gas (Bws):	0.064
Meter Volume (dscf)	20.38	SO_3 (ppm)	3.95
Meter Calibration (Y)	1.006		
Initial Wt. (grms or mls)	200.0	SO_3 (lbs/hr)	62.430
Final Wt. (grms or mls)	230.0		
Average Delta H (ΔH)	0.030		
Dry Standard Flow Rate (dscfm):	1,034,503		

METHOD 8A TEST RESULTS

Date:	3/16/2006	Condition:	Normal
Project:	AEP Conesville (ADA)	Data Taken By:	JLH
Location:	ESP Outlet	Fuel Factor:	9780
Source:	Unit 6		

Test Number:	1	Time:	15:00-16:00
Pressure, Barometric(Hg"):	29.000	Carbon Dioxide Content(%):	12.10
Pressure, Static(H_2O"):	-11.00	Oxygen Content(%):	6.90
Pressure, Stack(Hg"):	28.191	Nitrogen Content(%):	81.00
Initial Volume (cu.ft.)	57.951	SO_3 (ug)	34.8000
Final Volume (cu.ft.)	79.18		
Meter Temperature (°F)	64.21	Water Vapor in Flue Gas (Bws):	0.064
Meter Volume (dscf)	20.85	SO_3 (ppm)	14.46
Meter Calibration (Y)	1.006		
Initial Wt. (grms or mls)	200.0	SO_3 (lbs/hr)	228.388
Final Wt. (grms or mls)	230.0		
Average Delta H (ΔH)	0.030		
Dry Standard Flow Rate (dscfm)*:	1,034,503		

Test Number:	2	Time:	16:25-17:25
Pressure, Barometric(Hg"):	29.000	Carbon Dioxide Content(%):	12.10
Pressure, Static(H_2O"):	-11.00	Oxygen Content(%):	6.90
Pressure, Stack(Hg"):	28.191	Nitrogen Content(%):	81.00
Initial Volume (cu.ft.)	79.293	SO_3 (ug)	26.5000
Final Volume (cu.ft.)	100.29		
Meter Temperature (°F)	64.08	Water Vapor in Flue Gas (Bws):	0.064
Meter Volume (dscf)	20.63	SO_3 (ppm)	11.13
Meter Calibration (Y)	1.006		
Initial Wt. (grms or mls)	200.0	SO_3 (lbs/hr)	175.794
Final Wt. (grms or mls)	230.0		
Average Delta H (ΔH)	0.030		
Dry Standard Flow Rate (dscfm)*:	1,034,503		

Test Number:	3	Time:	17:45-18:45
Pressure, Barometric(Hg"):	29.000	Carbon Dioxide Content(%):	12.10
Pressure, Static(H_2O"):	-11.00	Oxygen Content(%):	6.90
Pressure, Stack(Hg"):	28.191	Nitrogen Content(%):	81.00
Initial Volume (cu.ft.)	0.324	SO_3 (ug)	25.3000
Final Volume (cu.ft.)	21.31		
Meter Temperature (°F)	62.00	Water Vapor in Flue Gas (Bws):	0.064
Meter Volume (dscf)	20.70	SO_3 (ppm)	10.59
Meter Calibration (Y)	1.006		
Initial Wt. (grms or mls)	200.0	SO_3 (lbs/hr)	167.255
Final Wt. (grms or mls)	230.0		
Average Delta H (ΔH)	0.030		
Dry Standard Flow Rate (dscfm)*:	1,034,503		

*Air flows taken from ESP Inlet data

CALIBRATION PROCEDURES

PITOT TUBES

The pitot tubes used during this test program are fabricated according to the specification described and illustrated in the *Code of Federal Regulations*, Title 40, Part 60, Appendix A, Methods 1 through 5 as published in the *Federal Register*, Volume 42, No. 160; hereafter referred to by the appropriate method number. The pitot tubes comply with the alignment specifications in Method 2, Section 4; and the pitot tube assemblies are in compliance with specifications in the same section.

Pitot tube assemblies are calibrated in accordance with Method 2, Section 4, against a standard hemispherical pitot utilizing a wind tunnel meeting the specification in Method 2, Section 4.1.2.

NOZZLES

The nozzles are measured according to Method 5, Section 5.1.

TEMPERATURE SENSING DEVICES

The potentiometer and thermocouples are calibrated against a mercury thermometer in a calibration well. Alternatively, readings are checked utilizing a NBS traceable millivolt source.

DRY GAS METERS

The test meters are calibrated according to Method 5, Section 5.3 and "Procedures for Calibrating and Using Dry Gas Volume Meters as Calibration Standards" by P.R. Westlin and R.T. Shigehara, March 10, 1978.

ANALYTICAL BALANCE

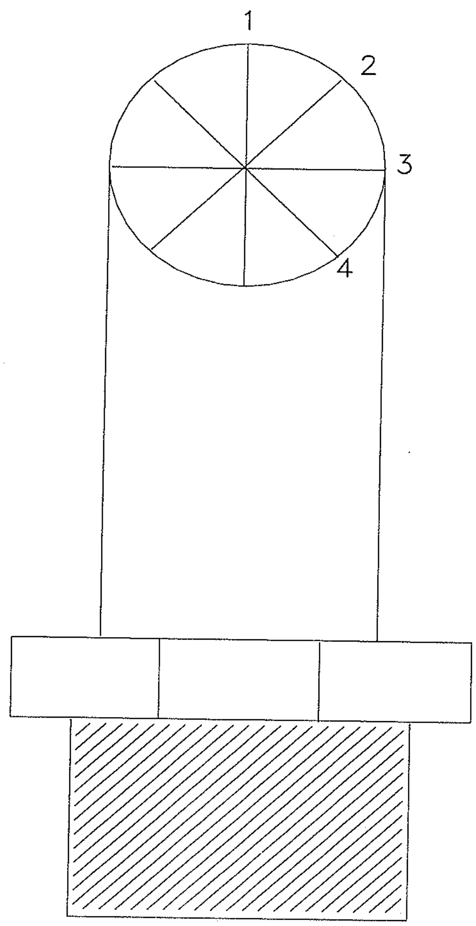
The accuracy of the analytical balance is checked with Class S, Stainless Steel Type 303 weights manufactured by F. Hopken and Son, Jersey City, New Jersey.

Nozzle Calibration

Date: 4/3/2006

Nozzle ID No.: N/A

Analyst: JFR



0.318	1
0.318	2
0.319	3
0.318	4

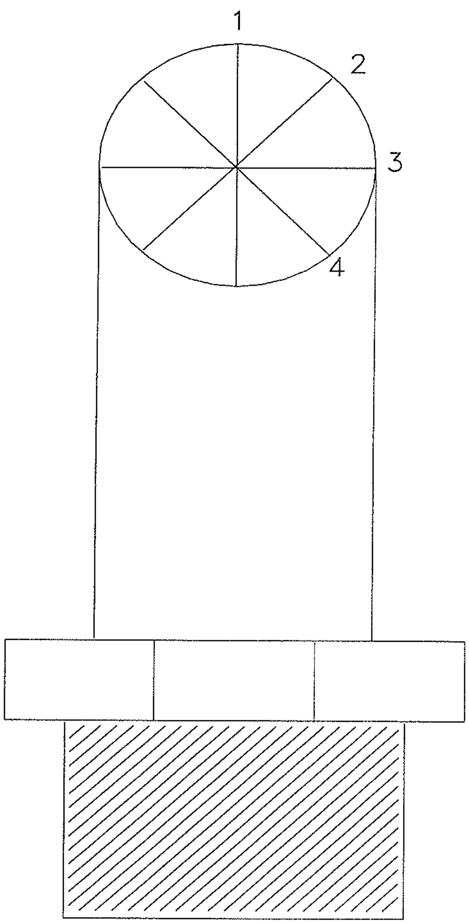
Average
0.318

Nozzle Calibration

Date: 4/3/2006

Nozzle ID No.: N/A

Analyst: JFR



0.328	1
0.328	2
0.326	3
0.326	4

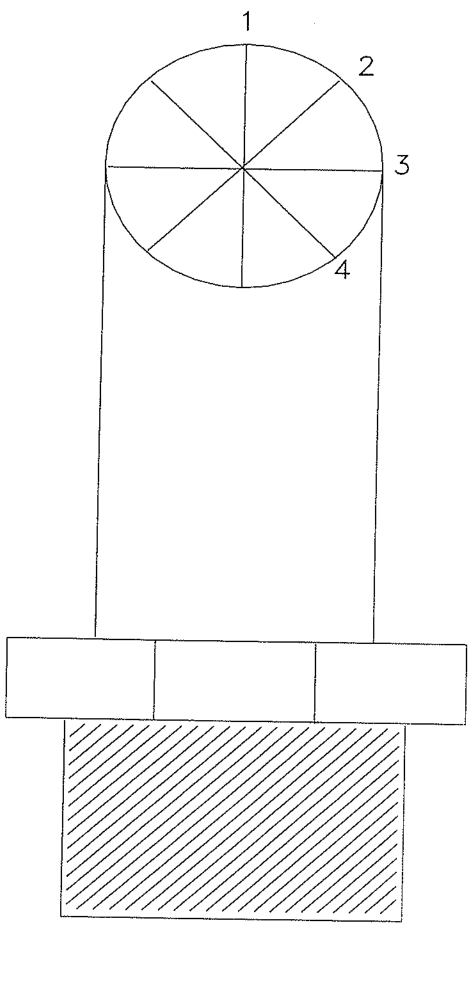
Average
0.327

Nozzle Calibration

Date: 4/3/2006

Nozzle ID No.: N/A

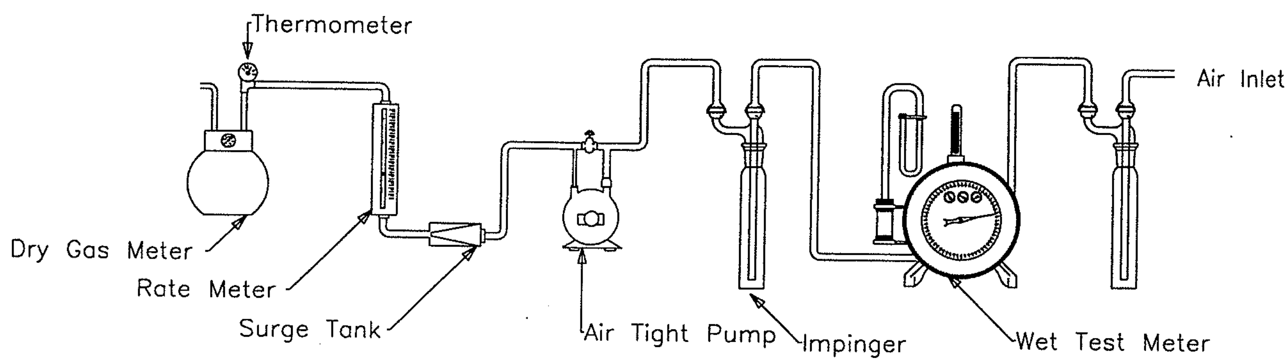
Analyst: JFR



0.135	1
0.134	2
0.135	3
0.136	4

Average
0.135

Gas Meter Calibration Train



METER BOX CALIBRATION

Dry Gas Meter No.	CM 7	Date:	March 6, 2006
Standard Meter No.	9605804	Calibrated By:	J.Robertson
Standard Meter (Yr)	0.9914	Barometric Pressure :	29.36

	Run Number	Orifice Setting in H20 Chg (H)	Standard Meter Gas Volume Vr	Dry Meter Gas Volume Vd	Standard Meter Temp. F tr	Dry Gas Meter Inlet Temp. F tdi	Dry Gas Meter Outlet Temp. F tdo	Dry Gas Meter Avg. Temp. F td	Time Min.	Time Sec.	Y	Chg (H@)
Final			322.541	420.482	63	67	67					
Inital			317.348	415.306	63	66	66					
Difference	1	0.20	5.193	5.176	63	67	67	67	18	10	1.009	1.372
Final			328.028	425.940	64	70	67					
Inital			322.770	420.702	64	67	67					
Difference	2	0.50	5.258	5.238	64	69	67	68	11	53	1.010	1.434
Final			333.539	431.459	64	72	68					
Inital			328.296	426.208	64	69	67					
Difference	3	0.70	5.243	5.251	64	71	68	69	10	8	1.006	1.464
Final			338.996	436.927	64	72	69					
Inital			333.857	431.772	64	71	68					
Difference	4	0.90	5.139	5.155	64	72	69	70	8	48	1.006	1.475
Final			344.272	442.252	64	73	69					
Inital			339.169	437.122	64	70	69					
Difference	5	1.20	5.103	5.130	64	72	69	70	7	38	1.004	1.500
Final			317.049	415.031	63	70	66					
Inital			311.913	409.883	63	67	66					
Difference	6	2.00	5.136	5.148	63	69	66	67	6	2	1.001	1.545
									Average		1.006	1.465

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM
(FOR K-TYPE THERMOCOUPLES)

EPA Control Module Number: CM 7 Name: J.Robertson

Ambient Temperature: 71.8 °F Date: March 6, 2006

Omega Engineering Calibrator Model No. CL23A Serial # T-249465

Date Of Calibration Verification: June 16, 2005

Primary Standards Directly Traceable to National Institute of Standards and Technology (NIST)

Reference[a] Source Temperature, (°F)	Test Thermometer Temperature, (°F)	Temperature Difference, %
0	-2	0.4
250	249	0.1
600	600	0.0
1200	1206	0.4

$$\frac{(\text{Ref. Temp., °F} + 460) - (\text{Test Therm. Temp., °F} + 460)}{\text{Ref. Temp., °F} + 460} * 100 <= 1.5\ \%$$

METER BOX CALIBRATION

Dry Gas Meter No. CM9
Standard Meter No. 9605804
Standard Meter (Yr) 0.9914

Date: 2-28-06
Calibrated By: Jeff Halla
Barometric Pressure : 30.05

Run Number		Orifice Setting in H20 Chg (H)	Standard Meter Gas Volume Vr	Dry Meter Gas Volume Vd	Standard Meter Temp. F tr	Dry Gas Meter Inlet Temp. F tdi	Dry Gas Meter Outlet Temp. F tdo	Dry Gas Meter Avg. Temp. F td	Time Min.	Time Sec.	Y	Chg (H@)
Final			259.852	135.155	69	72	72					
Inital			254.534	129.762	68	72	72					
Difference	1	0.20	5.318	5.393	69	72	72	72	18	16	0.992	1.306
Final			254.455	129.664	69	73	72					
Inital			249.001	124.228	68	73	71					
Difference	2	0.50	5.454	5.436	69	73	72	72	12	2	1.009	1.347
Final			248.771	124.005	68	73	71					
Inital			243.219	118.408	68	72	71					
Difference	3	0.70	5.552	5.597	68	73	71	72	10	28	0.997	1.375
Final			242.984	118.166	68	73	71					
Inital			237.963	113.102	68	72	71					
Difference	4	0.90	5.021	5.064	68	73	71	72	8	20	0.996	1.370
Final			237.963	112.958	67	72	71					
Inital			232.920	107.873	68	71	71					
Difference	5	1.20	5.043	5.085	68	72	71	71	7	45	0.996	1.565
Final			232.688	107.630	67	71	71					
Inital			227.642	102.499	67	71	71					
Difference	6	2.00	5.046	5.131	67	71	71	71	6	35	0.986	1.877
									Average		0.996	1.473

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM
(FOR K-TYPE THERMOCOUPLES)

EPA Control Module Number: CM9

Name: Jeff Halla

Ambient Temperature: 66.1 °F

Date: 2-28-06

Omega Engineering Calibrator Model No. CL23A Serial # T-249465

Date Of Calibration Verification: June 16, 2005

Primary Standards Directly Traceable to National Institute of Standards and Technology (NIST)

Reference[a] Source Temperature, (°F)	**Test Thermometer Temperature, (°F)**	**Temperature Difference, %**
0	6	1.3
250	255	0.7
600	603	0.3
1200	1203	0.2

$$\frac{(\text{Ref. Temp., °F} + 460) - (\text{Test Therm. Temp., °F} + 460)}{\text{Ref. Temp., °F} + 460} * 100 <= 1.5\ \%$$

METER BOX CALIBRATION

Dry Gas Meter No.	CM10	Date:	March 6, 2006
Standard Meter No.	9605804	Calibrated By:	J. Robertson
Standard Meter (Yr)	0.9914	Barometric Pressure :	29.31

Run Number		Orifice Setting in H20 Chg (H)	Standard Meter Gas Volume Vr	Dry Meter Gas Volume Vd	Standard Meter Temp. F tr	Dry Gas Meter Inlet Temp. F tdi	Dry Gas Meter Outlet Temp. F tdo	Dry Gas Meter Avg. Temp. F td	Time Min.	Time Sec.	Y	Chg (H@)
Final			276.386	81.858	71	74	73					
Inital			271.004	76.442	71	72	72					
Difference	1	0.20	5.382	5.416	71	73	73	73	18	27	0.996	1.345
Final			282.038	87.526	71	76	74.73					
Inital			276.616	82.064	71	74						
Difference	2	0.50	5.422	5.462	71	75	75	75	12	14	0.999	1.450
Final			288.147	93.663	71	77	74					
Inital			282.414	87.909	71	76	74					
Difference	3	0.70	5.733	5.754	71	77	74	75	10	49	1.003	1.419
Final			293.526	99.062	70	78	74					
Inital			288.379	93.897	70	75	74					
Difference	4	0.90	5.147	5.165	70	77	74	75	8	37	1.004	1.431
Final			298.951	104.518	71	79	75					
Inital			293.793	99.327	71	76	74					
Difference	5	1.20	5.158	5.191	71	78	75	76	7	39	1.000	1.501
Final			270.863	76.296	71	74	72					
Inital			265.588	71.029	70	72	72					
Difference	6	2.00	5.275	5.267	71	73	72	73	6	12	1.000	1.578
									Average		1.000	1.454

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM (FOR K-TYPE THERMOCOUPLES)

EPA Control Module Number: CM10 Name: J. Robertson

Ambient Temperature: 68.5 °F Date: March 6, 2006

Omega Engineering Calibrator Model No. CL23A Serial # T-249465

Date Of Calibration Verification: June 16, 2005

Primary Standards Directly Traceable to National Institute of Standards and Technology (NIST)

Reference[a] Source Temperature, (°F)	Test Thermometer Temperature, (°F)	Temperature Difference, %
0	5	1.1
250	257	1.0
600	608	0.8
1200	1213	0.8

$$\frac{(\text{Ref. Temp., °F} + 460) - (\text{Test Therm. Temp., °F} + 460)}{\text{Ref. Temp., °F} + 460} * 100 <= 1.5\ \%$$

TEST SUPPORT DATA

TEST PARAMETERS:

Test Run No. #1 1726A Run Date: 3-14-06

Field	Value
Company:	ADA
Plant:	AEP - CONESVILLE
Test Location:	UNIT 6 ESP INLET
Source Condition:	NORMAL
Test Engineer:	~~Ed~~
Temp ID:	CM-7
Meter ID:	CM-7
Meter Calibration Factor:	1.006
Pitot ID:	—
Pitot Tube Coefficient:	.84
Probe Length (ft.):	10'
Probe Liner Material:	TEFLON
Nozzle Diameter (in.):	.318
Train Setup (select):	

Field	Value
Duct Shape (select):	Rectangular or Round
Length (ft):	17.75
Diameter (ft):	
Width (ft):	43.50
Duct Area (Sq. Ft.):	772.125
Disturbance (in diameters)	Upstream ___ Downstream ___
Sample Plane (select):	Horizontal or Vertical
Port Length (in.):	18"
Port Size (diameter in.):	4
Port Type:	FLANGE
Number of Ports Sampled:	6
Number of Points per Port:	2
Minutes per Point:	5
Total Number of Traverse Points:	12
Test Length (min):	60

STACK CONDITIONS:

Barometric Pressure (in. Hg): 28.90

Static Pressure (in. H_2O): -12.0

Flue Pressure (in. Hg Abs): 28.02

Sample Train Leak Check: Pre: 0.00 Post: 0.00 @ 10/10 in. Hg

Pitot Leak Check: Pre ✓ Post ✓

Carbon Dioxide (%): 13.0

Oxygen (%): 6.0

Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)

Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal

10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other - ______

MOISTURE DETERMINATION:

Impinger Final Wt (mL): ______ Silica Final Wt (g): ______

Impinger Initial Wt (mL): * Silica Initial Wt (g): ______

Impinger Wt Gain (mL): ______ Silica Wt Gain (g): ______

Total Water Gain (mL/g): 51.6

Description of Impinger H_2O: ______

Silica Gel Exhausted?: ______

Impingers Recovered by: ______

Silica Gel Weighed by: ______

Sample Removed from Site by: ______

SAMPLE COLLECTION:

Thimble No. ______ Tare Wt (g) ______

Filter No. ______ Tare Wt (g) ______

COMMENTS & NOTES:

13.0
6.0

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: ADA
Plant: AEP Conesville
Test Location: Unit 6 ESP Inlet

X5

Test Method: M5/26A
Test Run No. #1
Date: 3-14-06
Traverse Sheet 1 of 1

	Port-Point No.	Clock Time	Velocity Head (□P) in. H_2O	4.76 Orifice (□H) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. □P	1.37 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
EAST	1-1	1000	.28	1.33	43.414	.529	.72	3.62		350	248	N/A	50	60	58	3.0
	-2	1005	.38	1.81	47.02	.616	.84	4.22	47.04	365	248		50	58	58	3.0
-.12		1010			51.26				51.26							
	2-1	1012	.34	1.62	51.38	.580	.80	3.99		346	247		50	59	58	3.0
	-2	1017	.36	1.81	55.37	.600	.82	4.11	55.37	355	247		50	62	58	4.0
		1022			59.48				59.48							
*.06	4-1	1025	.31	1.48	59.54	.557	.76	3.81		321	248		50	64	58	4.0
	-2	1030	.28	1.33	63.35	.529	.72	3.62	63.35	325	247		50	65	59	4.0
.03		1035			66.97				66.97							
	4-1	1036	.31	1.48	67.04	.551	.76	3.81		325	246		50	65	59	4.0
	-2	1041	.28	1.33	70.85	.529	.72	3.62	70.85	328	247		50	66	59	4.0
.09		1046			74.47				74.47							
	5-1	1047	.29	1.38	74.56	.539	.74	3.69		314	248		50	66	59	4.0
.09	-2	1052	.33	1.57	78.25	.574	.79	3.94	78.25	311	248		50	66	59	4.0
		1057			82.19				82.19							
WEST	6-1	1058	.25	1.19	82.28	.500	.69	3.43		308	248		50	67	60	4.0
	-2	1103	.33	1.57	85.71	.574	.79	3.94	85.71	307	248		50	67	60	4.0
		1108			89.651				89.65							
				1.492	46.237	.5565										
					-0.43					329.58				61.29		
					45.807											

* Port #3 is occupied - Port #4 is traversed twice.

TEST SUPPORT DATA

TEST PARAMETERS:

Test Run No. #2 Run Date: 3-14-06

Company: ADA
Plant: AEP Conesville
Test Location: Unit 6 ESP Inlet
Source Condition: Normal
Test Engineer: ~~A~~
Temp ID: CM-7
Meter ID: CM-7
Meter Calibration Factor: 1.006
Pitot ID: –
Pitot Tube Coefficient: .84
Probe Length (ft.): 10'
Probe Liner Material: Teflon
Nozzle Diameter (in.): .318
Train Setup (select):

Duct Shape (select): Rectangular or Round
Length (ft): 17.75 Diameter (ft): ____
Width (ft): 43.50
Duct Area (Sq. Ft.): 772.125
Disturbance (in diameters) Upstream ____ Downstream ____
Sample Plane (select): Horizontal or Vertical
Port Length (in.): 18''
Port Size (diameter in.): 4''
Port Type: Flange
Number of Ports Sampled: 6
Number of Points per Port: 2
Minutes per Point: 5
Total Number of Traverse Points: 12
Test Length (min): 60

STACK CONDITIONS:

Barometric Pressure (in. Hg): 28.90
Static Pressure (in. H_2O): -12''
Flue Pressure (in. Hg Abs): 28.02
Sample Train Leak Check: Pre: 0.00 Post: 0.00 @ 10/10 in. Hg
Pitot Leak Check: Pre ✓ Post ✓
Carbon Dioxide (%): ____
Oxygen (%): ____
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other - ____

COMMENTS & NOTES:

MOISTURE DETERMINATION:

Impinger Final Wt (mL): ____ Silica Final Wt (g): ____
Impinger Initial Wt (mL): ____ Silica Initial Wt (g): ____
Impinger Wt Gain (mL): ____ Silica Wt Gain (g): ____
Total Water Gain (mL/g): ____
Description of Impinger H_2O: ____
Silica Gel Exhausted?: ____
Impingers Recovered by: ____
Silica Gel Weighed by: ____
Sample Removed from Site by: ____

SAMPLE COLLECTION:

Thimble No. ____ Tare Wt (g) ____
Filter No. ____ Tare Wt (g) ____

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: ADA
Plant: AEP - CONESVILLE
Test Location: UNIT 6 ESP INLET

Test Method: M5/26A
Test Run No. #2
Date: 3-14-06
Traverse Sheet 1 of 1

X5

	Port-Point No.	Clock Time	Velocity Head (□P) in. H_2O	4.85 Orifice (□H) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. □P	1.37 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
EAST	1-1	1216	.24	1.16	24.281	.496	.67	3.36		360	249	N/A	51	62	58	5.0
	-2	1221	.35	1.70	27.64	.592	.81	4.05	27.64	368	248		51	63	58	5.0
		1226			31.69				31.69							
1.71	2-1	1246	.24	1.16	33.40	.490	.67	3.36		356	248		51	63	58	5.0
	-2	1251	.28	1.36	36.76	.529	.72	3.62	36.76	361	248		51	64	58	5.0
.08		1256			40.38				40.38							
*	4-1	1257	.31	1.50	40.46	.557	.76	3.81		331	247		51	66	59	5.0
	-2	1302	.28	1.36	44.27	.529	.72	3.62	44.27	331	249		51	67	60	5.0
.07 35		1307			47.89				47.89							
	4-1	1308	.31	1.50	47.96	.557	.76	3.81		332	248		51	67	60	5.0
	-2	1313	.28	1.36	51.77	.529	.72	3.62	51.77	331	248		51	68	61	5.0
.06		1318			55.39				55.39							
	5-1	1319	.27	1.31	55.45	.520	.71	3.56		315	247		51	68	61	5.0
	-2	1324	.37	1.79	59.01	.608	.83	4.17	59.01	310	246		51	68	61	5.0
.07		1329			63.18				63.18							
	6-1	1330	.25	1.21	63.25	.500	.69	3.43		300	246		51	68	61	5.0
WEST	-2	1335	.35	1.70	66.68	.592	.81	4.05	66.68	308	247		51	68	61	5.0
		1340			70.732				70.73							
				1.426	46.451											
					-1.99											
					44.461	.5411				333.58				62.83		

* DO PORT #4 TWICE - PORT 3 OCCUPIED

TEST SUPPORT DATA

TEST PARAMETERS:

Test Run No. #3 1/7/26A Run Date: 3-14-06

Company: ADA
Plant: AEP - CONESVILLE
Test Location: UNIT 6 ESP INLET
Source Condition: NORMAL
Test Engineer: ~~CA~~
Temp ID: CM-7
Meter ID: CM-7
Meter Calibration Factor: 1.006
Pitot ID: –
Pitot Tube Coefficient: .84
Probe Length (ft.): 10'
Probe Liner Material: TEFLON
Nozzle Diameter (in.): .318
Train Setup (select):

Duct Shape (select): Rectangular or Round
Length (ft): 17.75 Diameter (ft):
Width (ft): 43.50
Duct Area (Sq. Ft.): 772.125
Disturbance (in diameters) Upstream ____ Downstream ____
Sample Plane (select): Horizontal or Vertical
Port Length (in.): 18"
Port Size (diameter in.): 4"
Port Type: FLANGE
Number of Ports Sampled: 6
Number of Points per Port: 2
Minutes per Point: 5
Total Number of Traverse Points: 12
Test Length (min): 60

STACK CONDITIONS:

Barometric Pressure (in. Hg): 28.90
Static Pressure (in. H_2O): -12"
Flue Pressure (in. Hg Abs): 28.02
Sample Train Leak Check: Pre: 0.00 ✓ Post: 0.00 @ 10/10 in. Hg ✓
Pitot Leak Check: Pre ____ Post ____
Carbon Dioxide (%): 13.6
Oxygen (%): 6.0
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other - ____

MOISTURE DETERMINATION:

Impinger Final Wt (mL): ____ Silica Final Wt (g): ____
Impinger Initial Wt (mL): ____ Silica Initial Wt (g): ____
Impinger Wt Gain (mL): ____ Silica Wt Gain (g): ____
Total Water Gain (mL/g): 71.80
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

SAMPLE COLLECTION:

Thimble No. ____ Tare Wt (g) ____
Filter No. ____ Tare Wt (g) ____

COMMENTS & NOTES:

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: ADA
Plant: AEP - Conesville
Test Location: Unit 6 ESP Inlet

Test Method: M5/26A
Test Run No. # 3
Date: 3-14-06
Traverse Sheet 1 of 1

x5

	Port-Point No.	Clock Time	Velocity Head (□P) in. H_2O	4.85 Orifice (□H) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. □P	1.37 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
EAST	1-1	1425	.24	1.16	71.625	.490	.67	3.36		361	246	N/A	51	64	62	5.0
	-2	1430	.35	1.70	74.98	.592	.81	4.05	74.98	367	247		51	66	62	5.0
		1435			79.03				79.03							
-.04	2-1	1436	.24	1.16	79.07	.490	.67	3.36		353	247		51	68	62	5.0
	-2	1441	.33	1.60	82.43	.574	.79	3.94	82.43	358	247		51	69	62	5.0
.06		1446			86.37				86.37							
	4-1	1447	.31	1.50	86.43	.557	.76	3.81		323	246		51	69	62	5.0
.06	-2	1452	.30	1.46	90.21	.548	.75	3.75	90.24	323	247		51	69	62	5.0
		1457			93.99				93.99							
	4-1	1458	.32	1.55	94.05	.566	.77	3.87		323	245		51	69	62	5.0
-.08	-2	1503	.30	1.46	97.91	.548	.75	3.75	97.92	324	247		51	70	63	5.0
		1508			101.67				101.67							
	5-1	1509	.28	1.36	101.75	.529	.72	3.62		314	245		51	70	63	5.0
-.04	-2	1514	.36	1.75	105.38	.600	.82	4.11	105.37	322	248		51	70	63	5.0
		1519			109.48				109.48							
	6-1	1520	.28	1.36	109.52	.529	.72	3.62		300	247		51	70	63	5.0
WEST	-2	1525	.36	1.75	113.14	.600	.82	4.11	113.14	306	247		51	70	63	5.0
		1530			117.253				117.25							
					45.628											
					- .28											
				1.484	45.348	.5519				331.17				65.58		

TEST SUPPORT DATA

TEST PARAMETERS:

Test Run No. #4 17/26A Run Date: 8-14-06

Company: ADA
Plant: AEP - CONESVILLE
Test Location: UNIT 6 ESP INLET
Source Condition: NORMAL
Test Engineer: ~~[illegible]~~
Temp ID: CM-7
Meter ID: CM-7
Meter Calibration Factor: 1.006
Pitot ID: -
Pitot Tube Coefficient: .84
Probe Length (ft.): 10'
Probe Liner Material: TEFLON
Nozzle Diameter (in.): .318
Train Setup (select):

Duct Shape (select): Rectangular or Round
Length (ft): 17.75 Diameter (ft): ____
Width (ft): 43.50
Duct Area (Sq. Ft.): 772.125
Disturbance (in diameters) Upstream ____ Downstream ____
Sample Plane (select): Horizontal or Vertical
Port Length (in.): 18"
Port Size (diameter in.): 4"
Port Type: FLANGE
Number of Ports Sampled: 6
Number of Points per Port: 2
Minutes per Point: 5
Total Number of Traverse Points: 12
Test Length (min): 60

STACK CONDITIONS:

Barometric Pressure (in. Hg): 28.90
Static Pressure (in. H_2O): -12.0
Flue Pressure (in. Hg Abs): 28.02
Sample Train Leak Check: Pre: 0.00 Post: 0.00 @ 10/10 in. Hg
Pitot Leak Check: Pre ✓ Post ✓
Carbon Dioxide (%): 13
Oxygen (%): 6
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other - ____

MOISTURE DETERMINATION:

Impinger Final Wt (mL): ____ Silica Final Wt (g): ____
Impinger Initial Wt (mL): ____ Silica Initial Wt (g): ____
Impinger Wt Gain (mL): ____ Silica Wt Gain (g): ____
Total Water Gain (mL/g): 67.60
Description of Impinger H_2O: ____
Silica Gel Exhausted?: ____
Impingers Recovered by: ____
Silica Gel Weighed by: ____
Sample Removed from Site by: ____

SAMPLE COLLECTION:

Thimble No. ____ Tare Wt (g) ____
Filter No. ____ Tare Wt (g) ____

COMMENTS & NOTES:

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: ADA
Plant: AEP- CONESVILLE
Test Location: UNIT 6 ESP INLET

x5

Test Method: M5/26A
Test Run No. #4
Date: 3-14-06
Traverse Sheet 1 of 1

EAST

Port-Point No.	Clock Time	Velocity Head (□P) in. H_2O	4.85 Orifice (□H) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. □P	1.37 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	1620	.25	1.21	10.365	.500	.69	3.43		358	248	N/A	52	66	64	5.0
-2	1625	.36	1.75	21.79	.600	.82	4.11	21.79	364	249		52	66	64	5.0
	1630			25.90				25.90							
2-1	1631	.24	1.16	25.98	.490	.67	3.36		354	248		52	68	64	5.0
-2	1636	.31	1.50	29.34	.557	.76	3.81	29.34	360	248		52	69	64	5.0
	1641			33.15				33.15							
3-1	1642	.28	1.36	33.22	.529	.72	3.62		332	247		52	70	65	5.0
-2	1647	.30	1.46	36.84	.548	.75	3.75	36.84	333	246		52	71	65	5.0
	1652			40.59				40.59							
4-1	1653	.30	1.46	40.66	.548	.75	3.75		326	246		52	71	65	5.0
-2	1658	.30	1.46	44.40	.548	.75	3.75	44.41	328	245		52	72	65	5.0
	1703			48.16				48.16							
5-1	1704	.28	1.36	48.23	.529	.72	3.62		317	246		52	73	65	5.0
-2	1709	.38	1.84	51.85	.616	.84	4.22	51.85	321	246		52	73	66	5.0
	1714			56.07				56.07							
6-1	1715	.26	1.26	56.14	.510	.70	3.49		299	247		52	73	66	5.0
-2	1720	.36	1.75	59.63	.600	.82	4.11	59.63	307	246		52	73	66	5.0
	1725			63.744				63.74							
				45.379											
				-0.36											
			1.464	45.019	.5479				333.25				67.67		

-.08
-.07
-.07
-.07
-.07

WEST

TEST SUPPORT DATA

TEST PARAMETERS:

Test Run No. 1 S/2CA Run Date: 3/14/06

Company: AEP
Plant: Conensville, OH
Test Location: Unit 6 ESP Outlet
Source Condition: Normal
Test Engineer: JLH
Temp ID: Cm9
Meter ID: Cm9
Meter Calibration Factor: .996
Pitot ID: 005A
Pitot Tube Coefficient: .840
Probe Length (ft.): 10'
Probe Liner Material: Pyrex
Nozzle Diameter (in.): .327
Train Setup (select):

Duct Shape (select): Rectangular or Round
Length (ft): 15 Diameter (ft):
Width (ft): 40
Duct Area (Sq. Ft.): 600
Disturbance (in diameters) Upstream ____ Downstream ____
Sample Plane (select): Horizontal or Vertical
Port Length (in.):
Port Size (diameter in.): 4"
Port Type: Flange
Number of Ports Sampled: 8
Number of Points per Port: 2
Minutes per Point: 4
Total Number of Traverse Points: 16
Test Length (min): 64

STACK CONDITIONS:

Barometric Pressure (in. Hg): 28.9
Static Pressure (in. H_2O): -10
Flue Pressure (in. Hg Abs):
Sample Train Leak Check: Pre: .005 Post: 0.012 @ 10/5 in. Hg
Pitot Leak Check: Pre ✓ Post ✓
Carbon Dioxide (%): 12
Oxygen (%): 7
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -

MOISTURE DETERMINATION:

Impinger Final Wt (mL): 3858.4
Impinger Initial Wt (mL): 3910.8
Impinger Wt Gain (mL):
Total Water Gain (mL/g): 52.4
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

Silica Final Wt (g):
Silica Initial Wt (g):
Silica Wt Gain (g):

SAMPLE COLLECTION:

Thimble No. ____ Tare Wt (g) ____
Filter No. 149 Tare Wt (g) .3196

COMMENTS & NOTES:

Purge @ ΔH 1.35
Time 1117-1132

10% Bws
ΔH = 1.473
T_s ~~345~~ 339
K = ~~1.464~~ 1.436
K' = ~~5.488~~ 5.289
T_m = 60

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: AEP
Plant: Conesville, OH
Test Location: Unit 6 ESP Outlet

Test Method: 5/26A
Test Run No. 1
Date: 3/14/06
Traverse Sheet 1 of 1

Port-Point No.	Clock Time	Velocity Head (□P) in. H_2O	Orifice (□H) in. H_2O 5.289	Actual Meter Volume (V_m) ft^3	Sqrt. □P	Meter Rate cfm 1.436	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	1000	.25	1.3	35.557	.500	.732	5.490		334	260	262	41	52	51	4
2	1007.5	.27	1.4	41.000	.519	.746	5.595	41.647	326	263	261	43	55	51	4
	1015			46.397				46.595							
2-1	1019	.27	1.4	46.687	.519	.746	5.596		324	257	260	44	57	51	4
2	1026.5	.25	1.3	52.489	.500	.718	5.385	52.283	~~328~~	262	261	~~47~~	58	52	3
	1034			57.792				57.874							
3-1	1047	.20	1.0	58.630	.447	.637	4.782		326	~~25[illegible]~~	~~242~~	44	55	52	4
2	1054.5	.27	1.4	63.43	.519	.746	5.596	63.412	~~328~~	261	~~265~~	46	58	52	4
	1102							69.026							
4-1	1102	.27	1.4	69.026	.519	.746	5.596		~~331~~	261	~~262~~	~~46~~	58	52	5
2	1109.5	.30	1.6	74.53	.549	.786	5.898	74.622	334	255	262	47	58	52	5
	1117			80.436				80.428							
			Post leak												

1.35

TEST SUPPORT DATA

TEST PARAMETERS:

Test Run No. 2 /5/2cA Run Date: 3/14/06

Company: AEP
Plant: Conesville, OH
Test Location: Unit 6 ESP outlet
Source Condition: Normal
Test Engineer: JLH
Temp ID: Cm9
Meter ID: Cm9
Meter Calibration Factor: .996
Pitot ID: 005A
Pitot Tube Coefficient: .840
Probe Length (ft.): 10'
Probe Liner Material: Pyrex
Nozzle Diameter (in.): .327
Train Setup (select): Hot Box

Duct Shape (select): Rectangular or Round
Length (ft): 15.0 Diameter (ft): ____
Width (ft): 40.0
Duct Area (Sq. Ft.): 600.0
Disturbance (in diameters) Upstream ____ Downstream ____
Sample Plane (select): Horizontal or Vertical
Port Length (in.): 10'
Port Size (diameter in.): 4"
Port Type: Flange
Number of Ports Sampled: 4
Number of Points per Port: 2
Minutes per Point: 7.5
Total Number of Traverse Points: 8
Test Length (min): 60

STACK CONDITIONS:

Barometric Pressure (in. Hg): 28.9
Static Pressure (in. H_2O): -10
Flue Pressure (in. Hg Abs): ____
Sample Train Leak Check: Pre: 0.005 Post: 0.010 @ 10/15 in. Hg
Pitot Leak Check: Pre ✓ Post ✓
Carbon Dioxide (%): 12.5
Oxygen (%): 6.5
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other - ____

MOISTURE DETERMINATION:

Impinger Final Wt (mL): 3716.4 Silica Final Wt (g): ____
Impinger Initial Wt (mL): 3785.2 Silica Initial Wt (g): ____
Impinger Wt Gain (mL): ____ Silica Wt Gain (g): ____
Total Water Gain (mL/g): 68.80
Description of Impinger H_2O: ____
Silica Gel Exhausted?: ____
Impingers Recovered by: ____
Silica Gel Weighed by: ____
Sample Removed from Site by: ____

COMMENTS & NOTES:

Purge @ 1.4 ΔH
10% Bws
Tm = 60
Ts = 330
K = 1.432
K' = 5.289

SAMPLE COLLECTION:

Thimble No. ____ Tare Wt (g) ____
Filter No. ____ Tare Wt (g) ____

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: AEP
Plant: Conesville, OH
Test Location: Unit 6 ESP outlet

Test Method: 5/26A
Test Run No. 2
Date: 3/14/06
Traverse Sheet 1 of 1

Port-Point No.	Clock Time	Velocity Head (□P) in. H_2O	5.289 Orifice (□H) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. □P	1.436 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	1215	.27	1.4	95.643	.519	.746	5.596		316	252	262	45	54	51	5
2	1222.5	.27	1.4	101.18	.519	.746	5.596	101.239	326	266	263	48	57	52	5
	1230			106.79				106.776							
2-1	1230	.28	1.4	106.79	.529	.759	5.692		332	256	261	49	58	52	5
2	1237.5	.28	1.4	112.49	.529	.759	5.692	112.482	328	262	261	53	59	53	5
	1245			118.180				118.174							
3-1	1253	.25	1.3	118.480	.500	.718	5.385		332	261	260	49	58	54	5
2	1300.5	.24	1.2	123.85	.489	.703	5.276	123.865	324	259	262	52	60	55	5
	1308			129.10				129.126							
4-1	1308	.28	1.5	129.10	.529	.759	5.698		340	257	262	54	62	55	5
2	1315.5	.24	1.3	134.79	.489	.703	5.276	134.798	330	262	262	54	62	56	5
	1323			140.00				140.066							
	1338														

TEST SUPPORT DATA

TEST PARAMETERS:

Test Run No. 3 5/26A Run Date: 3/16/06

Company:	AEP	Duct Shape (select):	Rectangular or Round
Plant:	Conesville, OH	Length (ft):	15
Test Location:	Unit 6 ESP Outlet	Width (ft):	40
		Diameter (ft):	
Source Condition:	Normal	Duct Area (Sq. Ft.):	600
Test Engineer:	JLH	Disturbance (in diameters)	Upstream ___ Downstream ___
Temp ID:	Cmq	Sample Plane (select):	Horizontal or Vertical
Meter ID:	Cmq	Port Length (in.):	
Meter Calibration Factor:	.996	Port Size (diameter in.):	4''
Pitot ID:	1005A	Port Type:	Flange
Pitot Tube Coefficient:	.840	Number of Ports Sampled:	8
Probe Length (ft.):	10'	Number of Points per Port:	2
Probe Liner Material:	Pyrex	Minutes per Point:	4
Nozzle Diameter (in.):	.327	Total Number of Traverse Points:	16
Train Setup (select):	Hot Box	Test Length (min):	64

STACK CONDITIONS:

Barometric Pressure (in. Hg): 28.9

Static Pressure (in. H_2O): -10

Flue Pressure (in. Hg Abs):

Sample Train Leak Check: Pre: .005 Post: .020 @ 10/5 in. Hg

Pitot Leak Check: Pre ✓ Post ✓

Carbon Dioxide (%): 12

Oxygen (%): 7

Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)

Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal 10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -

MOISTURE DETERMINATION:

Impinger Final Wt (mL): 3934.8

Impinger Initial Wt (mL): 3874.2

Impinger Wt Gain (mL):

Total Water Gain (mL/g): 60.60

Silica Final Wt (g):

Silica Initial Wt (g):

Silica Wt Gain (g):

Description of Impinger H_2O:

Silica Gel Exhausted?:

Impingers Recovered by:

Silica Gel Weighed by:

Sample Removed from Site by:

SAMPLE COLLECTION:

Thimble No. Tare Wt (g)

Filter No. Tare Wt (g)

COMMENTS & NOTES:

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: AEP
Plant: Conesville, OH
Test Location: Unit 6 ESP outlet

Test Method: 5/26A
Test Run No. 3
Date: 3/14/06
Traverse Sheet 1 of 1

Port-Point No.	Clock Time	Velocity Head (□P) in. H_2O	5.435 Orifice (□H) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. □P	1.463 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	1435	.27	1.4	52.536	.519	.746	5.596		324	258	264	51	63	61	4
2	1442.5	.25	1.4	58.03	.500	.731	5.486	58.132	325	261	262	49	61	66	4
	1450							63.516							
2-1	1450	.24	1.3	63.49	.489	.716	5.375		340	257	263	53	68	62	3
2	1457.5	.24	1.3	68.89	.489	.716	5.375	68.865	340	262	262	53	67	62	3
	1505			74.36				74.240							
3-1	1509	.28	1.5	75.42	.529	.774	5.806		323	257	265	54	67	62	4
2	1516.5	.24	1.3	81.15	.489	.716	5.375	81.226	327	262	262	51	67	62	4
	1524			86.49				86.525							
4-1	1524	.28	1.5	86.49	.529	.774	5.806		327	264	262	52	67	62	4
2	1531.5	.28	1.5	92.25	.529	.774	5.806	92.296	326	262	262	52	68	62	4
	1539			98.000				98.056							
	1454														

TEST SUPPORT DATA

5.435
1.163

TEST PARAMETERS:

Test Run No. 4 3/26A Run Date: 3/14/06

Company: AEP
Plant: Conesville, OH
Test Location: Unit 6 ESP Outlet
Source Condition: Normal
Test Engineer: JLH
Temp ID: Cm1
Meter ID: Cm1
Meter Calibration Factor: .996
Pitot ID: 0005A
Pitot Tube Coefficient: .840
Probe Length (ft.): 10'
Probe Liner Material: Pyrex
Nozzle Diameter (in.): .327
Train Setup (select):

Duct Shape (select): Rectangular or Round
Length (ft): 15 Diameter (ft):
Width (ft): 40
Duct Area (Sq. Ft.): 600
Disturbance (in diameters) Upstream ____ Downstream ____
Sample Plane (select): Horizontal or Vertical
Port Length (in.):
Port Size (diameter in.): 4"
Port Type: Flange
Number of Ports Sampled: 4
Number of Points per Port: 2
Minutes per Point: 7.5
Total Number of Traverse Points: 8
Test Length (min): 60

STACK CONDITIONS:

Barometric Pressure (in. Hg): 28.7
Static Pressure (in. H_2O): -10
Flue Pressure (in. Hg Abs):
Sample Train Leak Check: Pre: .002 Post: .010 @ 10/6 in. Hg
Pitot Leak Check: Pre ✓ Post ✓
Carbon Dioxide (%): 12
Oxygen (%): 7
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -

MOISTURE DETERMINATION:

Impinger Final Wt (mL): 3740.4
Impinger Initial Wt (mL): 3691.8
Impinger Wt Gain (mL):
Total Water Gain (mL/g): 48.60
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

Silica Final Wt (g):
Silica Initial Wt (g):
Silica Wt Gain (g):

SAMPLE COLLECTION:

Thimble No. ____ Tare Wt (g) ____
Filter No. ____ Tare Wt (g) ____

COMMENTS & NOTES:

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: AEP
Plant: Coenswille, OH
Test Location: unit 6 ESP Outlet

Test Method: 5/26A
Test Run No. 4
Date: 3/14/06
Traverse Sheet 1 of 1

Port-Point No.	Clock Time	Velocity Head (□P) in. H_2O	5.435 Orifice (□H) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. □P	1.463 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	1620	.28	1.5	11.550	.529	.774	5.806		324	262	262	52	64	62	5
2	1627.5	.24	1.3	17.355	.489	.716	5.375	17.356	326	254	261	51	66	62	4
	1635			22.75				22.725							
2-1	1635	.30	1.6	22.75	.547	.801	6.009		326	262	263	53	67	62	4
2	1642.5	.28	1.5	28.70	.529	.774	5.806	28.759	326	262	262	52	66	61	4
	1650			34.500				34.506							
3-1	1655	.24	1.3	35.00	.489	.716	5.375		330	251	266	53	64	61	5
2	1702.5	.29	1.5	40.36	.538	.787	5.908	40.375	340	262	263	52	65	60	5
	1710			46.30				46.268							
4-1	1710	.30	1.6	46.30	.547	.861	6.009		339	261	262	53	66	60	5
2	1717.5	.27	1.5	52.30	.519	.760	5.701	52.309	339	261	262	54	66	60	5
	1725			58.020				58.001							

SUPPORT DATA

PARAMETERS: ONTARIO HYDRO #2

Test Run No. #2

Run Date: 3-16-06

Company: ADA

Plant: AEP - CONESVILLE

Test Location: UNIT 6 ESP INLET

Source Condition: NORMAL

Test Engineer: ~~[illegible]~~

Temp ID: CM-7

Meter ID: CM-7

Meter Calibration Factor: 1.006

Pitot ID: —

Pitot Tube Coefficient: .84

Probe Length (ft.): 10'

Probe Liner Material: TEFLON

Nozzle Diameter (in.): .268

Train Setup (select):

Duct Shape (select): Rectangular or Round

Length (ft): 17.75 Diameter (ft): ____

Width (ft): 43.5

Duct Area (Sq. Ft.): 772.125

Disturbance (in diameters) Upstream ____ Downstream ____

Sample Plane (select): Horizontal or Vertical

Port Length (in.): 18"

Port Size (diameter in.): 4"

Port Type: FLANGE

Number of Ports Sampled: 6

Number of Points per Port: 2

Minutes per Point: 10

Total Number of Traverse Points: 12

Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 29.00

Static Pressure (in. H_2O): -12"

Flue Pressure (in. Hg Abs): 28.12

Sample Train Leak Check: Pre: 0.00 Post: 0.00 @ 10/10 in. Hg

Pitot Leak Check: Pre ✓ Post ✓

Carbon Dioxide (%): 13

Oxygen (%): 6

Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)

Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal

10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other - ____

COMMENTS & NOTES:

MOISTURE DETERMINATION:

Impinger Final Wt (mL): 6103.0

Impinger Initial Wt (mL): 5995.0

Impinger Wt Gain (mL): ____

Total Water Gain (mL/g): 108.0

Description of Impinger H_2O: ____

Silica Gel Exhausted?: ____

Impingers Recovered by: ____

Silica Gel Weighed by: ____

Sample Removed from Site by: ____

Silica Final Wt (g): ____

Silica Initial Wt (g): ____

Silica Wt Gain (g): ____

SAMPLE COLLECTION:

Thimble No. ____ Tare Wt (g) ____

Filter No. ____ Tare Wt (g) ____

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: ADA
Plant: AEP- Conesville
Test Location: Unit 6 ESP Inlet

Test Method: Ontario Hydro
Test Run No. #2
Date: 3-16-06
Traverse Sheet 1 of 1

x10

Port-Point No.	Clock Time	Velocity Head (□P) in. H_2O	2.52 Orifice (□H) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. □P	1.00 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	0855	.24	.60	41.891	.490	.49	4.90		362	248	N/A	51	77	77	5.0
-2	0905	.35	.88	46.79	.592	.59	5.92	46.79	366	247		51	77	77	5.0
	0915			52.71				52.71							
2-1	0916	.24	.60	52.77	.490	.49	4.90		355	248		51	78	77	5.0
-2	0926	.30	.76	57.67	.548	.55	5.48	57.67	362	248		51	78	78	5.0
	0936			63.15				63.15							
3-1	0937	.31	.78	63.21	.557	.56	5.57		330	248		51	79	78	5.0
-2	0947	.30	.76	68.76	.548	.55	5.48	68.78	333	248		51	79	78	5.0
	0957			74.26				74.26							
4-1	0958	.31	.78	74.33	.557	.56	5.57		329	248		51	80	79	5.0
-2	1008	.29	.74	79.90	.539	.54	5.39	79.90	332	248		51	80	79	5.0
	1018			85.29				85.29							
5-1	1019	.27	.68	85.36	.520	.52	5.20		314	248		51	81	79	5.0
-2	1029	.37	.93	90.56	.608	.61	6.08	90.56	310	248		51	81	80	5.0
	1039			96.64				96.64							
6-1	1040	.27	.68	96.71	.520	.52	5.20		300	248		51	82	80	5.0
-2	1050	.36	.91	101.91	.600	.60	6.00	101.91	307	249		51	82	80	5.0
	1100			107.912				107.91							
				66.021											
				- .33											
			.7583	65.691	.5474				333.33				79.00		

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TEST SUPPORT DATA

TEST PARAMETERS: ONTARIO HYDRO #3

Test Run No. #3 Run Date: 8-16-06

Company: ADA
Plant: AEP CONESVILLE
Test Location: UNIT 6 ESP INLET
Source Condition: NORMAL
Test Engineer: [illegible]
Temp ID: CM-7
Meter ID: CM-7
Meter Calibration Factor: 1.006
Pitot ID: —
Pitot Tube Coefficient: .84
Probe Length (ft.): 10'
Probe Liner Material: TEFLON
Nozzle Diameter (in.): .268
Train Setup (select):

Duct Shape (select): Rectangular or Round
Length (ft): 17.75 Diameter (ft): ____
Width (ft): 43.50
Duct Area (Sq. Ft.): 772.125
Disturbance (in diameters) Upstream ____ Downstream ____
Sample Plane (select): Horizontal or Vertical
Port Length (in.): 18"
Port Size (diameter in.): 4"
Port Type: FLANGE
Number of Ports Sampled: 6
Number of Points per Port: 2
Minutes per Point: 10
Total Number of Traverse Points: 12
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 29.00
Static Pressure (in. H_2O): -12"
Flue Pressure (in. Hg Abs): 28.12
Sample Train Leak Check: Pre: 0.00 Post: 0.00 @ 10/10 in. Hg
Pitot Leak Check: Pre ✓ Post ✓
Carbon Dioxide (%): 13.0
Oxygen (%): 6.0
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other - ____

MOISTURE DETERMINATION:

Impinger Final Wt (mL): ____ Silica Final Wt (g): ____
Impinger Initial Wt (mL): ____ Silica Initial Wt (g): ____
Impinger Wt Gain (mL): ____ Silica Wt Gain (g): ____
Total Water Gain (mL/g): 104.6
Description of Impinger H_2O: ____
Silica Gel Exhausted?: ____
Impingers Recovered by: ____
Silica Gel Weighed by: ____
Sample Removed from Site by: ____

SAMPLE COLLECTION:

Thimble No. ____ Tare Wt (g) ____
Filter No. ____ Tare Wt (g) ____

COMMENTS & NOTES:

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: ADA
Plant: AEP - CONESVILLE
Test Location: UNIT 6 ESP INLET

Test Method: ONTARIO HYDRO
Test Run No. #3
Date: 3-16-06
Traverse Sheet 1 of 1

X10

Port-Point No.	Clock Time	Velocity Head (□P) in. H_2O	2.52 Orifice (□H) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. □P	1.00 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	1130	.25	.63	8.381	.500	.50	5.00		363	248	N/A	53	78	78	5.0
-2	1140	.35	.88	13.38	.592	.59	5.92	13.38	365	248		53	78	78	5.0
	1150			19.30				19.30							
2-1	1151	.27	.68	19.36	.520	.52	5.20		351	248		53	79	78	5.0
-2	1201	.34	.86	24.56	.583	.58	5.83	24.56	361	247		53	79	79	5.0
	1211			30.39				30.39							
3-1	1212	.31	.78	30.46	.557	.56	5.57		332	247		53	80	79	5.0
-2	1222	.28	.71	36.03	.529	.53	5.29	36.03	331	247		53	80	79	5.0
	1232			41.32				41.32							
4-1	1233	.31	.78	41.38	.557	.56	5.57		330	246		53	81	80	5.0
-2	1243	.30	.76	46.95	.548	.55	5.48	46.95	329	247		53	81	80	5.0
	1253			52.43				52.43							
5-1	1251	.26	.66	52.50	.510	.51	5.10		317	247		53	82	80	5.0
-2	1304	.38	.96	57.60	.616	.62	6.16	57.60	311	248		53	82	81	5.0
	1314			63.76				63.76							
6-1	1315	.25	.63	63.82	.500	.50	5.00		300	248		53	83	81	5.0
-2	1325	.35	.88	63.82	.592	.59	5.92	68.82	305	248		53	83	81	5.0
	1335			74.743				74.74							
				66.362											
				0.32											
		.7675		66.042	.5503				332.92				80.00		

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TEST SUPPORT DATA

TEST PARAMETERS: ONTARIO HYDRO #4

Test Run No. #4 Run Date: 3-17-06

Company: ADA

Plant: AEP - CONESVILLE

Test Location: UNIT 6 ESP INLET

Source Condition: NORMAL

Test Engineer: [illegible]

Temp ID: CM-7

Meter ID: CM-7

Meter Calibration Factor: 1.006

Pitot ID: —

Pitot Tube Coefficient: .84

Probe Length (ft.): 10'

Probe Liner Material: TEFLON

Nozzle Diameter (in.): .268

Train Setup (select):

Duct Shape (select): Rectangular or Round

Length (ft): 17.75 Diameter (ft):

Width (ft): 43.50

Duct Area (Sq. Ft.): 772.125

Disturbance (in diameters) Upstream ______ Downstream ______

Sample Plane (select): Horizontal or Vertical

Port Length (in.): 18"

Port Size (diameter in.): 4"

Port Type: FLANGE

Number of Ports Sampled: 6

Number of Points per Port: 2

Minutes per Point: 10

Total Number of Traverse Points: 12

Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 29.23

Static Pressure (in. H_2O): -12.0

Flue Pressure (in. Hg Abs): 28.35

Sample Train Leak Check: Pre: 0.00 Post: 0.00 @ 10/10 in. Hg

Pitot Leak Check: Pre ✓ Post ✓

Carbon Dioxide (%): 13

Oxygen (%): 6

Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)

Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal

10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -

MOISTURE DETERMINATION:

Impinger Final Wt (mL):

Impinger Initial Wt (mL):

Impinger Wt Gain (mL):

Total Water Gain (mL/g): 91.20

Description of Impinger H_2O:

Silica Gel Exhausted?:

Impingers Recovered by:

Silica Gel Weighed by:

Sample Removed from Site by:

Silica Final Wt (g):

Silica Initial Wt (g):

Silica Wt Gain (g):

SAMPLE COLLECTION:

Thimble No. ______ Tare Wt (g) ______

Filter No. ______ Tare Wt (g) ______

COMMENTS & NOTES:

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: ADA
Plant: AEP- Conesville
Test Location: Unit 6 ESP Inlet

Test Method: Ontario Hydro
Test Run No. #4
Date: 3-17-06
Traverse Sheet 1 of 1

x10

Port-Point No.	Clock Time	Velocity Head (□P) in. H_2O	2.52 Orifice (□H) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. □P	1.00 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	0805	.28	.71	43.320	.529	.53	5.29		363	248	N/A	52	76	76	5.0
-2	0815	.34	.86	48.61	.583	.58	5.83	48.61	367	247		52	76	76	5.0
	0825			54.44				54.44							
2-1	0826	.28	.71	54.50	.529	.53	5.29		358	247		52	77	76	5.0
-2	0836	.32	.81	59.80	.566	.57	5.66	59.79	361	247		52	77	77	5.0
	0846			65.45				65.45							
3-1	0847	.31	.78	65.52	.557	.56	5.57		331	248		52	78	77	5.0
-2	0857	.31	.78	71.08	.557	.56	5.57	71.09	330	246		52	78	77	5.0
	0907			76.66				76.66							
4-1	0908	.30	.76	76.73	.548	.55	5.48		328	248		52	79	78	5.0
-2	0918	.31	.78	82.21	.557	.56	5.57	82.21	330	247		52	79	78	5.0
	0928			87.78				87.78							
5-1	0929	.27	.68	87.85	.520	.52	5.20		310	246		52	80	78	5.0
-2	0939	.36	.91	93.05	.600	.60	6.00	93.05	312	245		52	80	79	5.0
	0949			99.05				99.05							
6-1	0950	.28	.71	99.13	.529	.53	5.29		300	245		52	81	79	5.0
-2	1000	.36	.91	104.42	.600	.60	6.00	104.42	305	245		52	81	79	5.0
	1010			110.424				110.42							
				67.104											
				-0.35											
			.7833	66.754	.5563				332.91				78.00		

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TEST SUPPORT DATA

TEST PARAMETERS: ONTARIO HYDRO

Test Run No. #5 Run Date: 3-17-06

Company: ADA
Plant: AEP - CONESVILLE
Test Location: UNIT 6 ESP INLET
Source Condition: NORMAL
Test Engineer: ~~[illegible]~~
Temp ID: CM-7
Meter ID: CM-7
Meter Calibration Factor: 1.006
Pitot ID: —
Pitot Tube Coefficient: .84
Probe Length (ft.): 10
Probe Liner Material: TEFLON
Nozzle Diameter (in.): .268
Train Setup (select):

Duct Shape (select): Rectangular or Round
Length (ft): 17.75 Diameter (ft):
Width (ft): 43.50
Duct Area (Sq. Ft.): 772.125
Disturbance (in diameters) Upstream ____ Downstream ____
Sample Plane (select): Horizontal or Vertical
Port Length (in.): 18"
Port Size (diameter in.): 4"
Port Type: FLANGE
Number of Ports Sampled: 6
Number of Points per Port: 2
Minutes per Point: 7
Total Number of Traverse Points: 12
Test Length (min): 84

STACK CONDITIONS:

Barometric Pressure (in. Hg): 29.23
Static Pressure (in. H_2O): -12.0"
Flue Pressure (in. Hg Abs): 28.35
Sample Train Leak Check: Pre: 0.00 ✓ Post: 0.00 @ 10/10 in. Hg
Pitot Leak Check: Pre ✓ Post ✓
Carbon Dioxide (%): 13
Oxygen (%): 6
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -

MOISTURE DETERMINATION:

Impinger Final Wt (mL): Silica Final Wt (g):
Impinger Initial Wt (mL): Silica Initial Wt (g):
Impinger Wt Gain (mL): Silica Wt Gain (g):
Total Water Gain (mL/g): 66.20
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

SAMPLE COLLECTION:

Thimble No. Tare Wt (g)
Filter No. Tare Wt (g)

COMMENTS & NOTES:

Company: ADA
Plant: AEP - CONESVILLE
Test Location: UNIT 6 ESP INLET

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Test Method: ONTARIO HYDRO
Test Run No. #5
Date: 3-17-06
Traverse Sheet 1 of 1

x7

Port-Point No.	Clock Time	Velocity Head (ΔP) in. H_2O	2.32 Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	1.00 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	1125	.26	.66	11.066	.510	.51	3.57		364	248	N/A	53	78	78	5.0
-2	1132	.33	.83	14.64	.574	.57	4.02	14.64	368	248		53	78	78	5.0
	1139			18.66				18.66							
2-1	1140	.28	.71	18.73	.529	.53	3.70		358	248		53	79	78	5.0
-2	1147	.33	.83	22.43	.574	.57	4.02	22.43	364	247		53	79	79	5.0
	1154			26.45				26.45							
3-1	1155	.32	.81	26.52	.566	.57	3.96		330	247		53	80	79	5.0
-2	1202	.32	.81	30.48	.566	.57	3.96	30.48	332	247		53	80	79	5.0
	1209			34.44				34.44							
4-1	1210	.30	.76	34.51	.548	.55	3.83		331	246		53	81	80	5.0
-2	1217	.32	.81	38.34	.566	.57	3.96	38.34	330	247		53	81	80	5.0
	1224			42.30				42.30							
5-1	1225	.28	.71	42.37	.529	.53	3.70		315	247		53	82	80	5.0
-2	1232	.36	.91	46.07	.600	.60	4.20	46.07	310	247		53	82	81	5.0
	1239			50.27				50.27							
6-1	1240	.28	.71	50.34	.529	.53	3.70		299	248		53	83	81	5.0
-2	1247	.36	.91	54.04	.600	.60	4.20	54.04	307	245		53	83	81	5.0
	1254			58.245				58.24							
				47.179											
				-.35											
			.7883	46.829	.5576				334.00				80.	00	

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TEST SUPPORT DATA

TEST PARAMETERS:

Test Run No. 2 Run Date: 3/16/06

Company: AEP
Plant: Conesville, OH
Test Location: Unit 6 ESP Outlet
Source Condition: Normal
Test Engineer: JLH
Temp ID: Cmg
Meter ID: Cmg
Meter Calibration Factor: .996
Pitot ID: 0005A
Pitot Tube Coefficient: .840
Probe Length (ft.): 10'
Probe Liner Material: Pyrex
Nozzle Diameter (in.): .271
Train Setup (select):

Duct Shape (select): Rectangular or Round
Length (ft): 15 Diameter (ft):
Width (ft): 40
Duct Area (Sq. Ft.): 600
Disturbance (in diameters) Upstream ______ Downstream ______
Sample Plane (select): Horizontal or Vertical
Port Length (in.):
Port Size (diameter in.): 4"
Port Type: Flange
Number of Ports Sampled: 1
Number of Points per Port: 1
Minutes per Point: 5
Total Number of Traverse Points: 1
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 29.10
Static Pressure (in. H_2O): -11
Flue Pressure (in. Hg Abs):
Sample Train Leak Check: Pre: .005 Post: .003 @ 10/5 in. Hg
Pitot Leak Check: Pre ✓ Post ✓
Carbon Dioxide (%): 12
Oxygen (%): 7
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -

MOISTURE DETERMINATION:

Impinger Final Wt (mL): 6240.6 Silica Final Wt (g):
Impinger Initial Wt (mL): 6158.8 Silica Initial Wt (g):
Impinger Wt Gain (mL): Silica Wt Gain (g):
Total Water Gain (mL/g): 81.80
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

SAMPLE COLLECTION:

Thimble No. Tare Wt (g)
Filter No. 159 Tare Wt (g) 0.2693

COMMENTS & NOTES: Tm=50

K= .968

K'= 2.469

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: AEP
Plant: Conesville, OH
Test Location: Unit 6 ESP outlet

Test Method: 0 H
Test Run No. 2
Date: 3/16/06
Traverse Sheet 1 of 1

Port-Point No.	Clock Time	Velocity Head (□P) in. H_2O	2.469 Orifice (□H) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. □P	.968 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1	855	.31	.76	26.153	.556	.538	2.694		335	247	257	41	52	48	3
2	900	.31	.76	28.90	.556	.538	2.694	28.847	335	248	258	40	53	48	3
3	905	.31	.76	31.54	.556	.538	2.694	31.594	337	249	255	41	55	49	3
4	910	.31	.76	34.20	.556	.538	2.694	34.234	337	251	255	42	56	50	4
5	915	.31	.76	36.91	.556	.538	2.694	36.894	337	252	255	44	57	50	4
6	920	.31	.76	39.60	.556	.538	2.694	39.604	337	252	255	43	58	51	4
7	925	.31	.76	42.31	.556	.538	2.694	42.294	337	254	255	45	58	52	4
8	930	.31	.76	45.07	.556	.538	2.694	45.004	338	254	255	44	59	52	4
9	935	.31	.76	47.79	.556	.538	2.694	47.764	338	254	255	46	59	53	4
10	940	.30	.74	50.51	.547	.530	2.651	50.484	338	254	255	45	59	53	4
11	945	.30	.74	53.19	.547	.530	2.651	53.161	338	255	255	46	59	53	4
12	950	.30	.74	55.87	.547	.530	2.651	55.841	338	254	255	45	59	53	4
13	955	.30	.74	58.55	.547	.520	2.651	58.521	338	254	255	46	60	54	4
14	1000	.30	.74	61.20	.547	.530	2.651	61.201	338	255	255	45	60	54	4
15	1005	.30	.74	63.85	.547	.530	2.651	63.851	338	254	255	41	60	55	4
16	1010	.30	.74	66.51	.547	.530	2.651	66.501	338	255	255	46	60	55	4
17	1015	.30	.74	69.09	.547	.530	2.651	69.071	339	255	255	47	60	55	4
18	1020	.30	.74	71.73	.547	.530	2.651	71.741	339	254	255	46	60	55	4
19	1025	.30	.74	74.40	.547	.530	2.651	74.381	339	255	255	48	61	55	4
20	1030	.30	.74	77.05	.547	.530	2.651	77.051	340	255	255	47	61	55	4
21	1035	.30	.74	79.70	.547	.530	2.651	79.201	339	254	255	49	62	56	4
22	1040	.30	.74	82.35	.547	.530	2.651	82.351	338	252	252	48	63	57	4
23	1045	.30	.74	85.05	.547	.530	2.651	85.001	339	254	256	49	63	57	4
24	1050	.30	.74	87.74	.547	.530	2.651	87.701	339	254	255	49	63	57	4
	1055			90.402				90.391							

TEST SUPPORT DATA

TEST PARAMETERS:

Test Run No. 2 Run Date: 3/16/06

Company: AEP
Plant: Conesville, OH
Test Location: Unit 6 ESP outlet
Source Condition: Normal
Test Engineer: JLH
Temp ID: Cm9
Meter ID: Cm9
Meter Calibration Factor: .996
Pitot ID: 0005A
Pitot Tube Coefficient: .840
Probe Length (ft.): 10'
Probe Liner Material: Pyrex
Nozzle Diameter (in.): .271
Train Setup (select):

Duct Shape (select): Rectangular or Round
Length (ft): 15 Diameter (ft):
Width (ft): 40
Duct Area (Sq. Ft.): 600
Disturbance (in diameters) Upstream ____ Downstream ____
Sample Plane (select): Horizontal or Vertical
Port Length (in.):
Port Size (diameter in.): 4"
Port Type: Flange
Number of Ports Sampled: 1
Number of Points per Port: 1
Minutes per Point: 5
Total Number of Traverse Points: 1
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 29.10
Static Pressure (in. H_2O): -11
Flue Pressure (in. Hg Abs):
Sample Train Leak Check: Pre: .005 Post: .006 @ 10/15 in. Hg
Pitot Leak Check: Pre ✓ Post ✓
Carbon Dioxide (%): 12
Oxygen (%): 7
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -

MOISTURE DETERMINATION:

Impinger Final Wt (mL): 5713.4
Impinger Initial Wt (mL): 5619.6
Impinger Wt Gain (mL):
Total Water Gain (mL/g): 93.80
Silica Final Wt (g):
Silica Initial Wt (g):
Silica Wt Gain (g):
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

SAMPLE COLLECTION:

Thimble No. ____ Tare Wt (g) ____
Filter No. ____ Tare Wt (g) ____

COMMENTS & NOTES:

Ts 335 K=.994
Tm=65 K'=2.525

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: AEP
Plant: Conesville, old
Test Location: Unit 6 ESP outlet

Test Method: 5H
Test Run No. 3
Date: 3/16/06
Traverse Sheet 1 of 1

Port-Point No.	Clock Time	Velocity Head (□P) in. H_2O	2.525 Orifice (□H) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. □P	.994 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1	1130	.29	.73	91.479	.538	.535	2.676		338	243	256	51	61	59	4
2	1135	.29	.73	94.19	.538	.535	2.676	94.155	339	244	260	52	62	59	4
3	1140	.30	.75	96.88	.547	.544	2.722	96.866	339	247	256	54	63	59	4
4	1145	.30	.75	99.63	.547	.544	2.722	99.602	340	251	255	55	65	60	4
5	1150	.30	.75	102.36	.547	.544	2.722	102.352	340	253	255	54	66	60	4
6	1155	.30	.75	105.10	.547	.544	2.722	105.082	340	253	255	55	66	60	4
7	1200	.30	.75	107.86	.547	.544	2.722	107.822	340	255	255	53	66	61	4
8	1205	.30	.75	110.55	.547	.544	2.722	110.582	339	256	255	54	66	61	4
9	1210	.30	.75	113.28	.547	.544	2.722	113.272	339	254	255	52	67	61	4
10	1215	.30	.75	116.01	.547	.544	2.722	116.002	340	256	255	54	67	62	4
11	1220	.30	.75	118.70	.547	.544	2.722	118.732	340	255	255	53	67	62	4
12	1225	.30	.75	121.39	.547	.544	2.722	121.422	339	255	259	54	68	62	4
13	1230	.30	.75	124.20	.547	.544	2.722	124.112	339	255	255	53	68	63	4
14	1235	.30	.75	126.88	.547	.544	2.722	126.922	339	256	255	55	68	63	4
15	1240	.30	.75	129.58	.547	.544	2.722	129.602	338	255	255	54	69	63	4
16	1245	.30	.75	132.31	.547	.544	2.722	132.302	338	255	255	55	69	64	4
17	1250	.30	.75	135.03	.547	.544	2.722	135.032	339	255	255	55	69	64	4
18	1255	.30	.75	137.71	.547	.544	2.722	137.752	339	255	255	56	69	64	4
19	1300	.30	.75	140.40	.547	.544	2.722	140.432	340	256	255	55	69	64	4
20	1305	.30	.75	143.18	.547	.544	2.722	143.122	340	255	255	57	70	64	4
21	1310	.30	.75	145.91	.547	.544	2.722	145.902	339	255	255	56	70	65	4
22	1315	.30	.75	148.65	.547	.544	2.722	148.632	340	255	255	58	70	65	4
23	1320	.30	.75	151.39	.547	.544	2.722	151.372	340	255	255	58	70	65	4
24	1325	.30	.75	154.12	.547	.544	2.722	154.112	340	256	255	58	70	65	4
	1330			156.849				156.842							

TEST SUPPORT DATA

TEST PARAMETERS:

Test Run No. #4 Run Date: 3/17/06

Company: AEP
Plant: Conesville, OH
Test Location: Unit #6 ESP outlet
Source Condition: Normal
Test Engineer: JCH
Temp ID: Cmq
Meter ID: Cmq
Meter Calibration Factor: .996
Pitot ID: 0005A
Pitot Tube Coefficient: .840
Probe Length (ft.): 10'
Probe Liner Material: Pyrex
Nozzle Diameter (in.): .271
Train Setup (select):

Duct Shape (select): Rectangular or Round
Length (ft): 15 Diameter (ft):
Width (ft): 40
Duct Area (Sq. Ft.): 600
Disturbance (in diameters) Upstream ____ Downstream ____
Sample Plane (select): Horizontal or Vertical
Port Length (in.):
Port Size (diameter in.): 4"
Port Type: Flange
Number of Ports Sampled: 1
Number of Points per Port: 1
Minutes per Point: 5
Total Number of Traverse Points: 1
Test Length (min): 120

STACK CONDITIONS:

Barometric Pressure (in. Hg): 29.23
Static Pressure (in. H_2O): -11
Flue Pressure (in. Hg Abs):
Sample Train Leak Check: Pre: .006 Post: .005 @ 10/5 in. Hg
Pitot Leak Check: Pre ✓ Post ✓
Carbon Dioxide (%): 12
Oxygen (%): 7
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 - Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 - Fuel Oil 8710 - Natural Gas Other -

MOISTURE DETERMINATION:

Impinger Final Wt (mL): Silica Final Wt (g):
Impinger Initial Wt (mL): Silica Initial Wt (g):
Impinger Wt Gain (mL): Silica Wt Gain (g):
Total Water Gain (mL/g): 110.20
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

COMMENTS & NOTES:

Tm = 50 K = .963
Ts = 335 K' = 2.453

SAMPLE COLLECTION:

Thimble No. Tare Wt (g)
Filter No. Tare Wt (g)

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: AEP
Plant: Conesville, OH
Test Location: Unit 6 ESP outlet

Test Method: OH
Test Run No. #4
Date: 3/17/06
Traverse Sheet 1 of 1

Port-Point No.	Clock Time	Velocity Head (□P) in. H_2O	2.453 Orifice (□H) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. □P	.963 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1	805	.32	.78	22.010	.565	.545	2.723		328	250	260				
2	810	.32	.78	24.78	.565	.545	2.723	24.733	328	250	260	41	45	42	5
3	815	.34	.83	27.47	.583	.561	2.807	27.504	329	250	262	41	45	42	5
4	820	.34	.83	30.28	.583	.561	2.807	30.277	329	251	260	39	47	42	5
5	825	.34	.83	33.04	.583	.561	2.807	33.087	330	251	260	39	48	42	5
6	830	.34	.83	35.84	.583	.561	2.807	35.847	330	250	260	37	49	42	5
7	835	.34	.83	38.63	.583	.561	2.807	38.654	330	250	260	38	49	43	5
8	840	.34	.83	41.42	.583	.561	2.807	41.461	331	250	260	37	50	43	5
9	845	.34	.83	44.19	.583	.561	2.807	44.227	331	250	260	38	50	44	5
10	850	.34	.83	46.96	.583	.561	2.807	46.997	331	250	260	38	50	44	5
11	855	.34	.83	49.73	.583	.561	2.807	49.767	331	250	260	38	51	44	5
12	900	.34	.83	52.52	.583	.561	2.807	52.537	332	250	260	37	51	44	5
13	905	.34	.83	55.29	.583	.561	2.807	55.334	331	250	260	37	51	45	5
14	910	.34	.83	58.07	.583	.561	2.807	58.091	332	250	260	37	51	45	5
15	915	.34	.83	60.81	.583	.561	2.807	60.877	331	250	260	39	51	45	5
16	920	.34	.83	63.70	.583	.561	2.807	63.677	332	250	260	38	51	45	5
17	925	.34	.83	66.50	.583	.561	2.807	66.507	332	251	260	37	51	46	5
18	930	.34	.83	69.30	.583	.561	2.807	69.307	331	251	260	39	51	46	5
19	935	.34	.83	72.10	.583	.561	2.807	72.107	332	250	260	37	51	46	5
20	940	.34	.83	74.90	.583	.561	2.807	74.907	332	250	260	39	51	46	5
21	945	.34	.83	77.71	.583	.561	2.807	77.707	332	250	260	39	51	46	5
22	950	.34	.83	80.49	.583	.561	2.807	80.517	332	250	260	38	51	46	5
23	955	.34	.83	83.28	.583	.561	2.807	83.29	332	250	260	39	51	46	5
24	1000	.34	.83	86.09	.583	.561	2.807	86.087	332	250	260	39	31	46	5
	1005							88.897							

TEST SUPPORT DATA

TEST PARAMETERS: METALS TEST # 1

Test Run No. #1 Run Date: 3-15-06

Company: ADA-
Plant: AEP - CONESVILLE
Test Location: UNIT 6 ESP INLET
Source Condition: NORMAL
Test Engineer: [illegible]
Temp ID: CM-7
Meter ID: CM-7
Meter Calibration Factor: 1.006
Pitot ID: —
Pitot Tube Coefficient: .84
Probe Length (ft.): 10'
Probe Liner Material: TEFLON
Nozzle Diameter (in.): .318
Train Setup (select):

Duct Shape (select): Rectangular or Round
Length (ft): 17.75 Diameter (ft):
Width (ft): 43.50
Duct Area (Sq. Ft.): 772.125
Disturbance (in diameters) Upstream ____ Downstream ____
Sample Plane (select): Horizontal or Vertical
Port Length (in.): 18"
Port Size (diameter in.): 4"
Port Type: FLANGE
Number of Ports Sampled: 6
Number of Points per Port: 2
Minutes per Point: 7.5
Total Number of Traverse Points: 12
Test Length (min): 90

STACK CONDITIONS:

Barometric Pressure (in. Hg): 29.15
Static Pressure (in. H_2O): -12'
Flue Pressure (in. Hg Abs): 28.27
Sample Train Leak Check: Pre: 0.00 Post: 0.00 @ 10/10 in. Hg
Pitot Leak Check: Pre ✓ Post ✓
Carbon Dioxide (%): 13
Oxygen (%): 6
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other - ____

MOISTURE DETERMINATION:

Impinger Final Wt (mL): 4189.8
Impinger Initial Wt (mL): 4303.8
Impinger Wt Gain (mL): 114.0
Total Water Gain (mL/g): 114.0
Silica Final Wt (g):
Silica Initial Wt (g):
Silica Wt Gain (g):
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

SAMPLE COLLECTION:

Thimble No. ____ Tare Wt (g) ____
Filter No. ____ Tare Wt (g) ____

COMMENTS & NOTES:

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: ADA
Plant: AEP - Conesville
Test Location: Unit 6 ESP Inlet

Test Method: M-29 (Metals)
Test Run No. #1
Date: 3-15-06
Traverse Sheet 1 of 1

x 7.5

	Port-Point No.	Clock Time	Velocity Head (□P) in. H_2O	4.85 Orifice (□H) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. □P	1.37 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
	1-1	0800	.33	1.60	64.536	.574	.79	5.90		362	249	N/A	51	64	61	5.0
-.07	-2	0807.5	.26	1.26	70.44	.510	.70	5.24	70.44	360	248		51	71	62	5.0
		0815			75.68				75.68							
	2-1	0816	.25	1.21	75.75	.500	.69	5.14		354	246		51	75	65	5.0
-.05	-2	0823.5	.28	1.34	80.89	.529	.72	5.44	80.89	360	246		51	76	66	5.0
		0831			86.33				86.33							
	3-1	0832	.31	1.50	86.38	.557	.76	5.72		330	245		51	78	68	5.0
-.07	-2	0839.5	.29	1.41	92.08	.539	.74	5.53	92.10	332	246		51	80	70	5.0
		0847			97.63				97.63							
	4-1	0848	.32	1.55	97.70	.566	.77	5.81		333	246		51	83	70	5.0
-.05	-2	0855.5	.29	1.41	103.51	.539	.74	5.53	103.51	330	246		51	84	71	5.0
		0903			109.04				109.04							
	5-1	0904	.27	1.31	109.09	.520	.71	5.34		315	246		51	85	73	5.0
-.07	-2	0911.5	.36	1.75	114.43	.600	.82	6.17	114.43	310	246		51	86	75	5.0
		0919			120.60				120.60							
	6-1	0920	.25	1.21	120.67	.500	.69	5.14		299	245		51	87	76	5.0
	-2	0927.5	.35	1.70	125.81	.592	.81	6.08	125.81	306	247		51	88	77	5.0
		0935			131.891				131.89							
					67.355											
					-0.31											
				1.439	67.045	.5438				332.58					74.63	

TEST SUPPORT DATA

TEST PARAMETERS: METALS TEST #2

Test Run No. #2 Run Date: 3-15-06

Company: ADA
Plant: AEP - CONESVILLE
Test Location: UNIT 6 ESP INLET
Source Condition: NORMAL
Test Engineer: CH
Temp ID: CM-7
Meter ID: CM-7
Meter Calibration Factor: 1.006
Pitot ID: —
Pitot Tube Coefficient: .84
Probe Length (ft.): 10'
Probe Liner Material: TEFLON
Nozzle Diameter (in.): .318
Train Setup (select):

Duct Shape (select): Rectangular or Round
Length (ft): 17.75 Diameter (ft): ____
Width (ft): 43.50
Duct Area (Sq. Ft.): 772.125
Disturbance (in diameters) Upstream ____ Downstream ____
Sample Plane (select): Horizontal or Vertical
Port Length (in.): 18"
Port Size (diameter in.): 4"
Port Type: FLANGE
Number of Ports Sampled: 6
Number of Points per Port: 2
Minutes per Point: 7.5
Total Number of Traverse Points: 12
Test Length (min): 90

STACK CONDITIONS:

Barometric Pressure (in. Hg): 29.15
Static Pressure (in. H_2O): -12"
Flue Pressure (in. Hg Abs): 28.27
Sample Train Leak Check: Pre: 0.00 Post: 0.00 @ 10/10 in. Hg
Pitot Leak Check: Pre ✓ Post ✓
Carbon Dioxide (%): 13
Oxygen (%): 6
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other - ____

MOISTURE DETERMINATION:

Impinger Final Wt (mL): ____ Silica Final Wt (g): ____
Impinger Initial Wt (mL): ____ Silica Initial Wt (g): ____
Impinger Wt Gain (mL): ____ Silica Wt Gain (g): ____
Total Water Gain (mL/g): 82.40
Description of Impinger H_2O: ____
Silica Gel Exhausted?: ____
Impingers Recovered by: ____
Silica Gel Weighed by: ____
Sample Removed from Site by: ____

SAMPLE COLLECTION:

Thimble No. ____ Tare Wt (g) ____
Filter No. ____ Tare Wt (g) ____

COMMENTS & NOTES:

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: ADA
Plant: AEP - Conesville
Test Location: Unit 6 ESP Inlet

Test Method: M-29 (METALS)
Test Run No. #2
Date: 3-15-06
Traverse Sheet 1 of 1

x 7.5

	Port-Point No.	Clock Time	Velocity Head (ΔP) in. H_2O	4.99 Orifice (ΔH) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. ΔP	1.41 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
	1-1	1120	.25	1.25	33.953	.500	.71	5.29		362	248	N/A	51	78	78	5.0
-.07	-2	1127.5	.36	1.80	39.24	.600	.85	6.35	39.24	360	248		51	78	78	5.0
		1135			45.59				45.59							
	2-1	1136	.24	1.20	45.66	.490	.69	5.18		355	248		51	79	78	5.0
-.07	-2	1143.5	.31	1.55	50.84	.557	.79	5.89	50.84	362	248		51	79	79	5.0
		1151			56.73				56.73							
	3-1	1152	.30	1.50	56.80	.548	.77	5.79		331	247		51	80	79	5.0
-.07	-2	1159.5	.27	1.35	62.59	.520	.73	5.49	62.59	330	247		51	80	79	5.0
		1207			68.08				68.08							
	4-1	1208	.31	1.55	68.15	.557	.79	5.89		325	247		51	81	80	5.0
-.07	-2	1215.5	.28	1.40	74.04	.529	.75	5.60	74.04	330	248		51	81	80	5.0
		1223			79.64				79.64							
	5-1	1224	.27	1.35	79.71	.520	.73	5.49		318	247		51	82	80	5.0
	-2	1231.5	.36	1.80	85.20	.600	.85	6.35	85.20	314	247		51	82	81	5.0
-.06		1239			91.55				91.55							
	6-1	1240	.27	1.35	91.61	.520	.73	5.49		303	247		51	83	81	5.0
	-2	1247.5	.35	1.75	97.10	.592	.83	6.26	97.10	307	247		51	83	81	5.0
		1255			103.362				103.36							
					69.409											
					-0.34											
				1.488	69.069	.5444				333.08				80.00		

TEST SUPPORT DATA

TEST PARAMETERS: METALS TEST #3

Test Run No. #3 Run Date: 3-15-06

Company: ADA
Plant: AEP - CONESVILLE
Test Location: UNIT 6 ESP INLET
Source Condition: NORMAL
Test Engineer:
Temp ID: CM-7
Meter ID: CM-7
Meter Calibration Factor: 1.006
Pitot ID: —
Pitot Tube Coefficient: .84
Probe Length (ft.): 10'
Probe Liner Material: TEFLON
Nozzle Diameter (in.): .318
Train Setup (select):

Duct Shape (select): Rectangular or Round
Length (ft): 17.75 Diameter (ft):
Width (ft): 43.50
Duct Area (Sq. Ft.): 772.125
Disturbance (in diameters) Upstream ____ Downstream ____
Sample Plane (select): Horizontal or Vertical
Port Length (in.): 18"
Port Size (diameter in.): 4"
Port Type: FLANGE
Number of Ports Sampled: 6
Number of Points per Port: 2
Minutes per Point: 7.5
Total Number of Traverse Points: 12
Test Length (min): 90

STACK CONDITIONS:

Barometric Pressure (in. Hg): 29.15
Static Pressure (in. H_2O): -12.0"
Flue Pressure (in. Hg Abs): 28.27
Sample Train Leak Check: Pre: 0.00 Post: 0.00 @ 10/10 in. Hg
Pitot Leak Check: Pre ✓ Post ✓
Carbon Dioxide (%): 13
Oxygen (%): 6
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -

MOISTURE DETERMINATION:

Impinger Final Wt (mL):
Impinger Initial Wt (mL):
Impinger Wt Gain (mL):
Total Water Gain (mL/g): 105.8
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

Silica Final Wt (g):
Silica Initial Wt (g):
Silica Wt Gain (g):

SAMPLE COLLECTION:

Thimble No. ____ Tare Wt (g) ____
Filter No. ____ Tare Wt (g) ____

COMMENTS & NOTES:

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: ADA
Plant: AEP- Conesville
Test Location: Unit 6 ESP Inlet

x 7.5

Test Method: M-29 (Metals)
Test Run No. #3
Date: 3-15-06
Traverse Sheet 1 of 1

Port-Point No.	Clock Time	Velocity Head (□P) in. H_2O	Orifice (□H) in. H_2O (4.99)	Actual Meter Volume (V_m) ft^3	Sqrt. □P	Meter Rate cfm (1.41)	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	1615	.25	1.25	70.458	.500	.71	5.29		352	248	N/A	54	83	83	5.0
-2	1622.5	.34	1.70	75.75	.583	.82	6.17	75.75	366	248		54	83	83	5.0
	1630			81.92				81.92							
2-1	1631	.25	1.25	81.99	.500	.71	5.29		358	245		54	84	83	5.0
-2	1638.5	.29	1.45	87.28	.539	.76	5.69	87.28	362	245		54	84	84	5.0
	1646			92.97				92.97							
3-1	1647	.31	1.55	93.04	.557	.79	5.89		330	245		54	85	84	5.0
-2	1654.5	.30	1.50	98.93	.548	.77	5.79	98.93	330	246		54	85	84	5.0
	1702			104.72				104.72							
4-1	1703	.31	1.55	104.77	.557	.79	5.89		331	247		54	86	85	5.0
-2	1710.5	.28	1.40	110.66	.529	.75	5.60	110.66	330	248		54	86	85	5.0
	1718			116.26				116.26							
5-1	1719	.27	1.35	116.31	.520	.73	5.49		312	247		54	87	85	5.0
-2	1726.5	.36	1.80	121.80	.600	.85	6.35	121.80	310	248		54	87	86	5.0
	1734			128.15				128.15							
6-1	1735	.25	1.25	128.22	.500	.71	5.29		299	247		54	88	86	5.0
-2	1742.5	.36	1.80	133.51	.600	.85	6.35	133.51	307	247		54	88	86	5.0
	1750			139.863				139.86							
				69.405											
				-.31											
			1.4875	69.095	.5444				332.25				85.00		

-.07 -.07 -.05 -.05 -.07

TEST SUPPORT DATA

TEST PARAMETERS:

Test Run No. ① M29 Run Date: 3/15/06

Company: AEP
Plant: Conesville, OH
Test Location: Unit 6 ESP Outlet
Source Condition: Normal
Test Engineer: JCH
Temp ID: Cm9
Meter ID: Cm9
Meter Calibration Factor: .996
Pitot ID: 0005A
Pitot Tube Coefficient: .840
Probe Length (ft.): 10'
Probe Liner Material: Pyrex
Nozzle Diameter (in.): .327
Train Setup (select):

Duct Shape (select): Rectangular or Round
Length (ft): 15 Diameter (ft):
Width (ft): 40
Duct Area (Sq. Ft.): 600
Disturbance (in diameters) Upstream ____ Downstream ____
Sample Plane (select): Horizontal or Vertical
Port Length (in.):
Port Size (diameter in.): 4"
Port Type: Flange
Number of Ports Sampled: 1
Number of Points per Port: 1
Minutes per Point: 5
Total Number of Traverse Points: 1
Test Length (min): 90

STACK CONDITIONS:

Barometric Pressure (in. Hg): 29.15
Static Pressure (in. H_2O): -10
Flue Pressure (in. Hg Abs):
Sample Train Leak Check: Pre: .005 Post: .010 @ 10/7 in. Hg
Pitot Leak Check: Pre ✓ Post ✓
Carbon Dioxide (%): 12
Oxygen (%): 7
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -

MOISTURE DETERMINATION:

Impinger Final Wt (mL): 4457.8
Impinger Initial Wt (mL): 4569.4
Impinger Wt Gain (mL): 111.60
Total Water Gain (mL/g): 111.60
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

Silica Final Wt (g):
Silica Initial Wt (g):
Silica Wt Gain (g):

SAMPLE COLLECTION:

Thimble No. ____ Tare Wt (g) ____
Filter No. 185 Tare Wt (g) 0.3538

COMMENTS & NOTES:

$T_s = 325$ $K = 1.429$
$T_m = 55$ $K' = 5.333$
$B_{ws} = 10\%$

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: AEP
Plant: Conesville, OH
Test Location: Unit 6 ESP outlet

Test Method: M29
Test Run No. (1)
Date: 3/15/06
Traverse Sheet 1 of 1

Port-Point No.	Clock Time	Velocity Head (□P) in. H_2O	5,333 Orifice (□H) in. H_2O	Actual Meter Volume (V_m) ft³	Sqrt. □P	1.429 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft³	Theoretical Meter Volume (V_m) ft³	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1	800	.24	1.2	69.702	.489	.700	3.500	—	317	250	262	42	48	46	5
2	805	.25	1.3	73.17	.500	.714	3.572	73.202	329	254	262	41	51	47	5
3	810	.25	1.3	76.70	.500	.714	3.572	76.742	329	257	262	41	53	47	5
4	815	.25	1.3	80.27	.500	.714	3.572	80.272	329	260	262	39	54	47	5
5	820	.25	1.3	83.84	.500	.714	3.572	83.842	331	262	262	40	55	48	6
6	825	.25	1.3	87.40	.500	.714	3.572	87.412	330	261	262	39	56	49	6
7	830	.26	1.4	90.97	.509	.728	3.643	90.972	330	263	262	40	57	49	6
8	835	.26	1.4	94.61	.509	.728	3.643	94.613	330	262	262	39	57	49	6
9	840	.25	1.3	98.24	.500	.714	3.572	98.256	330	262	262	40	57	50	6
10	845	.25	1.3	101.80	.500	.714	3.572	101.812	330	262	262	39	57	50	6
11	850	.25	1.3	105.39	.500	.714	3.572	105.372	320	262	262	40	57	50	6
12	855	.25	1.3	109.00	.500	.714	3.572	108.962	330	262	262	40	57	50	5
13	900	.25	1.3	112.59	.500	.714	3.572	112.572	330	262	262	39	57	50	5
14	905	.25	1.3	116.15	.500	.714	3.572	116.162	331	262	262	40	57	51	5
15	910	.25	1.3	119.82	.500	.714	3.572	119.722	330	262	262	39	57	51	5
16	915	.25	1.3	123.34	.500	.714	3.572	123.392	330	262	262	40	58	51	5
17	920	.25	1.3	126.90	.500	.714	3.572	126.912	331	262	263	39	58	51	5
18	925	.25	1.3	130.42	.500	.714	3.572	130.412	330	262	262	40	58	51	5
	930			133.992				133.992							

TEST SUPPORT DATA

TEST PARAMETERS:

Test Run No. 2 Run Date: 3/15/06

Company: AEP
Plant: Conesville, OH
Test Location: Unit 6 ESP Outlet
Source Condition: Normal
Test Engineer: JCH
Temp ID: Cma
Meter ID: Cma
Meter Calibration Factor: .996
Pitot ID: 0005 A
Pitot Tube Coefficient: .840
Probe Length (ft.): 10'
Probe Liner Material: Pyrex
Nozzle Diameter (in.): .327
Train Setup (select):

Duct Shape (select): Rectangular or Round
Length (ft): 15 Diameter (ft):
Width (ft): 40
Duct Area (Sq. Ft.): 600
Disturbance (in diameters) Upstream ____ Downstream ____
Sample Plane (select): Horizontal or Vertical
Port Length (in.):
Port Size (diameter in.): 4"
Port Type: Flange
Number of Ports Sampled: 1
Number of Points per Port: 1
Minutes per Point: 5
Total Number of Traverse Points: 1
Test Length (min): 90

STACK CONDITIONS:

Barometric Pressure (in. Hg): 29.15
Static Pressure (in. H_2O): -10
Flue Pressure (in. Hg Abs):
Sample Train Leak Check: Pre: .003 Post: .008 @ 10/6 in. Hg
Pitot Leak Check: Pre ✓ Post ✓
Carbon Dioxide (%): 12
Oxygen (%): 7
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -

MOISTURE DETERMINATION:

Impinger Final Wt (mL): Silica Final Wt (g):
Impinger Initial Wt (mL): Silica Initial Wt (g):
Impinger Wt Gain (mL): Silica Wt Gain (g):
Total Water Gain (mL/g): 82.0
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

SAMPLE COLLECTION:

Thimble No. Tare Wt (g)
Filter No. 186 Tare Wt (g) .3413

COMMENTS & NOTES:

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: AEP
Plant: Conesville, OH
Test Location: Unit 6 ESP outlet

Test Method: M29
Test Run No. 2
Date: 2/15/06
Traverse Sheet 1 of 1

Port-Point No.	Clock Time	Velocity Head (□P) in. H_2O	Orifice (□H) in. H_2O 5.351	Actual Meter Volume (V_m) ft^3	Sqrt. □P	Meter Rate cfm 1.439	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1	1120	.23	1.2	34.25	.479	.690	3.451		329	247	275	50	57	52	5
2	1125	.24	1.3	37.701	.489	.705	3.524	37.701	329	248	270	50	58	52	5
3	1130	.24	1.3	41.225	.489	.705	3.524	41.225	330	251	250	50	59	53	5
4	1135	.24	1.3	44.74	.489	.705	3.524	44.749	329	250	249	49	60	53	5
5	1140	.24	1.3	48.22	.489	.705	3.524	48.264	330	250	249	49	61	54	5
6	1145	.24	1.3	51.73	.489	.705	3.524	51.744	330	250	250	47	61	54	5
7	1150	.24	1.3	55.20	.489	.705	3.524	55.254	328	249	250	48	62	55	5
8	1155	.24	1.3	58.70	.489	.705	3.524	58.724	330	251	250	47	62	55	5
9	1200	.24	1.3	62.28	.489	.705	3.524	62.224	329	250	250	48	62	55	5
10	1205	.24	1.3	65.88	.489	.705	3.524	65.809	329	250	250	47	63	56	5
11	1210	.24	1.3	69.40	.489	.705	3.524	69.404	329	250	250	50	64	56	5
12	1215	.23	1.2	72.90	.479	.690	3.450	72.924	328	250	250	49	64	57	5
13	1220	.23	1.2	76.30	.479	.690	3.450	76.351	328	250	250	52	66	58	5
14	1225	.23	1.2	79.78	.479	.690	3.450	79.750	329	250	250	53	67	59	5
15	1230	.23	1.2	83.30	.479	.690	3.450	83.230	328	250	250	56	68	61	5
16	1235	.23	1.2	86.80	.479	.690	3.450	86.750	328	249	250	56	68	62	5
17	1240	.23	1.2	90.29	.479	.690	3.450	90.250	329	250	250	59	69	63	5
18	1245	.23	1.2	93.70	.479	.690	3.450	93.740	329	250	250	59	70	64	5
	1250			97.250											

TEST SUPPORT DATA

TEST PARAMETERS:

Test Run No. 3 M29 Run Date: 3/15/06

Company: AEP
Plant: Coensvill, OH
Test Location: Unit 6 ESP Outlet
Source Condition: Normal
Test Engineer: JLH
Temp ID: Cmg
Meter ID: Cmg
Meter Calibration Factor: .996
Pitot ID: 0005A
Pitot Tube Coefficient: .840
Probe Length (ft.): 10'
Probe Liner Material: Pyrex
Nozzle Diameter (in.): .327
Train Setup (select):

Duct Shape (select): Rectangular or Round
Length (ft): 15 Diameter (ft):
Width (ft): 40
Duct Area (Sq. Ft.):
Disturbance (in diameters) Upstream ____ Downstream ____
Sample Plane (select): Horizontal or Vertical
Port Length (in.):
Port Size (diameter in.): 4"
Port Type: Flange
Number of Ports Sampled: 1
Number of Points per Port: 1
Minutes per Point: 5
Total Number of Traverse Points: 1
Test Length (min): 90

STACK CONDITIONS:

Barometric Pressure (in. Hg): 29.15
Static Pressure (in. H_2O): -10
Flue Pressure (in. Hg Abs):
Sample Train Leak Check: Pre: .005 Post: .006 @ 10/15 in. Hg
Pitot Leak Check: Pre ✓ Post ✓
Carbon Dioxide (%): 12
Oxygen (%): 7
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -

MOISTURE DETERMINATION:

Impinger Final Wt (mL):
Impinger Initial Wt (mL):
Impinger Wt Gain (mL):
Total Water Gain (mL/g): 89.60
Silica Final Wt (g):
Silica Initial Wt (g):
Silica Wt Gain (g):
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

SAMPLE COLLECTION:

Thimble No. ____ Tare Wt (g) ____
Filter No. ____ Tare Wt (g) ____

COMMENTS & NOTES:

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: AEP
Plant: Conesville, OH
Test Location: Unit 6 ESP outlet

Test Method: M29
Test Run No. ③
Date: 3/15/09
Traverse Sheet 1 of 1

Port-Point No.	Clock Time	Velocity Head (□P) in. H_2O	5.505 Orifice (□H) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. □P	1.480 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1	1615	.24	1.3	59.752	.489	.725	3.625		318	240	256	57	70	71	7
2	1620	.24	1.3	63.38	.489	.725	3.625	63.377	331	255	256	48	70	72	4
3	1625	.23	1.3	67.09	.479	.709	3.548	67.005	331	256	256	47	73	70	4
4	1630	.23	1.3	70.60	.479	.709	3.548	70.638	331	255	255	44	73	69	4
5	1635	.23	1.3	74.15	.479	.709	3.548	74.148	332	255	255	44	73	69	4
6	1640	.23	1.3	77.65	.479	.709	3.548	77.698	332	255	255	42	73	68	4
7	1645	.23	1.3	81.20	.479	.709	3.548	81.198	332	255	255	43	73	68	4
8	1650	.23	1.3	84.75	.479	.709	3.548	84.748	332	255	255	41	72	67	4
9	1655	.23	1.3	88.30	.479	.709	3.548	88.298	332	255	255	43	72	67	4
10	1700	.23	1.3	91.86	.479	.709	3.548	91.848	332	255	255	41	71	67	4
11	1705	.27	1.5	95.38	.519	.769	3.845	95.408	332	256	255	43	71	66	4
12	1710	.27	1.5	99.20	.519	.769	3.845	99.225	331	255	255	41	71	66	4
13	1715	.27	1.5	103.08	.519	.769	3.845	103.045	332	255	255	43	72	66	4
14	1720	.27	1.5	106.98	.519	.769	3.845	106.925	331	255	255	42	71	65	4
15	1725	.27	1.5	110.85	.519	.769	3.845	110.825	331	255	255	43	71	65	4
16	1730	.27	1.5	114.70	.519	.769	3.845	114.695	331	255	255	42	71	65	4
17	1735	.29	1.6	118.56	.538	.797	3.985	118.545	332	255	255	43	71	65	4
18	1740	.29	1.6	122.50	.538	.797	3.985	122.545	331	255	255	42	71	65	4
	1745			126.498				126.485							

TEST SUPPORT DATA

TEST PARAMETERS:

Test Run No. 1 Run Date: 3/17/06

Company: AEP
Plant: Conesville, OH
Test Location: unit 6 FGD outlet
Source Condition: Normal
Test Engineer: SLH
Temp ID: CM10
Meter ID: CM10
Meter Calibration Factor: 1.000
Pitot ID: 0005A
Pitot Tube Coefficient: .84
Probe Length (ft.): 10'
Probe Liner Material: Pyrex
Nozzle Diameter (in.): .135
Train Setup (select):

Duct Shape (select): Rectangular or Round
Length (ft): 26 Diameter (ft):
Width (ft): 20
Duct Area (Sq. Ft.): 520
Disturbance (in diameters) Upstream ___ Downstream ___
Sample Plane (select): Horizontal or Vertical
Port Length (in.):
Port Size (diameter in.): 4"
Port Type: Nipple
Number of Ports Sampled: 8
Number of Points per Port: 2
Minutes per Point: 5
Total Number of Traverse Points: 16
Test Length (min): 80

STACK CONDITIONS:

Barometric Pressure (in. Hg): 29.23
Static Pressure (in. H_2O): 1
Flue Pressure (in. Hg Abs):
Sample Train Leak Check: Pre: .002 Post: .018 @ 10/5 in. Hg
Pitot Leak Check: Pre ✓ Post ✓
Carbon Dioxide (%): 12
Oxygen (%): 7
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other -

MOISTURE DETERMINATION:

Impinger Final Wt (mL): Silica Final Wt (g):
Impinger Initial Wt (mL): Silica Initial Wt (g):
Impinger Wt Gain (mL): Silica Wt Gain (g):
Total Water Gain (mL/g): 106.2
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

SAMPLE COLLECTION:

Thimble No. Tare Wt (g)
Filter No. Tare Wt(g)

COMMENTS & NOTES: Ts=126 Tm=55 K=.284 K'=.210

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: AEP
Plant: Conesville, OH
Test Location: unit 6 FGD outlet

Test Method: 6H
Test Run No. 1
Date: 3/17/06
Traverse Sheet 1 of 1

Port-Point No.	Clock Time	Velocity Head (□P) in. H_2O	.210 Orifice (□H) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. □P	.284 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	1125	3.1	.65	4,695	1.760	.500	2.500		125	249	260	40	49	47	3
2	1130	2.8	.59	7.18	1.673	.475	2.376	7.195	126	260	262	39	50	48	3
	1135			9.556				9.556							
2-1	1136	2.9	.61	9.556	1.702	.484	2.418		125	265	271	40	52	49	3
2	1141	2.6	.54	11.98	1.612	.457	2.289	11.974	125	271	272	41	54	49	3
	1146			14.285				14.269							
3-1	1147	2.7	.56	14.285	1.643	.467	2.333		126	270	271	43	55	50	3
2	1152	2.7	.56	16.58	1.643	.467	2.333	16.618	125	269	271	42	56	50	3
	1157			18.982				18.913							
4-1	1158	2.8	.58	18.922	1.673	.475	2.376		126	269	270	43	56	51	3
2	1203	2.8	.58	21.31	1.673	.475	2.376	21.308	126	270	270	43	56	51	3
	1208			23.105				23.686							
5-1	1215	2.8	.58	23.105	1.673	.475	2.376		125	263	278	41	53	50	3
2	1220	2.6	.54	25.51	1.612	.457	2.289	25.481	126	264	272	42	54	50	3
	1225			27.81				27.799							
6-1	1226	2.6	.54	27.81	1.612	.457	2.289		128	265	270	43	53	50	3
2	1231	2.6	.54	30.10	1.612	.457	2.289	30.099	124	265	270	44	55	51	3
	1236			32.401				32.389							
7-1	1237	2.6	.54	32.401	1.612	.457	2.289		124	263	270	44	55	51	3
2	1242	2.6	.54	34.68	1.612	.457	2.289	34.690	124	259	270	44	56	52	3
	1247			37.00				36.969							
8-1	1248	2.6	.54	37.00	1.612	.457	2.289		125	261	270	42	55	52	3
2	1253	2.6	.54	39.31	1.612	.457	2.289	39.289	125	260	270	43	55	51	3
	1258			41.601				41.599							

K, 284
K', 210

TEST SUPPORT DATA

TEST PARAMETERS:

Test Run No. ② Run Date: 3/17/06

Company: AEP
Plant: Conesville, OH
Test Location: Unit 6 FGD
Source Condition: Normal
Test Engineer: JCH
Temp ID: CM10
Meter ID: CM10
Meter Calibration Factor: 1.000
Pitot ID: .005A
Pitot Tube Coefficient: .846
Probe Length (ft.): 10'
Probe Liner Material: Pyrex
Nozzle Diameter (in.): .135
Train Setup (select):

Duct Shape (select): Rectangular or Round
Length (ft): 26 Diameter (ft):
Width (ft): 20
Duct Area (Sq. Ft.): 520
Disturbance (in diameters) Upstream ______ Downstream ______
Sample Plane (select): Horizontal or Vertical
Port Length (in.):
Port Size (diameter in.): 4"
Port Type: Flange
Number of Ports Sampled: 8
Number of Points per Port: 2
Minutes per Point: 5
Total Number of Traverse Points: 16
Test Length (min): 80

STACK CONDITIONS:

Barometric Pressure (in. Hg): 29.23
Static Pressure (in. H_2O): 1
Flue Pressure (in. Hg Abs):
Sample Train Leak Check: Pre: .006 Post: .005 @ 10 / 6 in. Hg
Pitot Leak Check: Pre ✓ Post ✓
Carbon Dioxide (%): 12
Oxygen (%): 7
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 - Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 - Fuel Oil 8710 - Natural Gas Other - ______

MOISTURE DETERMINATION:

Impinger Final Wt (mL): ______ Silica Final Wt (g): ______
Impinger Initial Wt (mL): ______ Silica Initial Wt (g): ______
Impinger Wt Gain (mL): ______ Silica Wt Gain (g): ______
Total Water Gain (mL/g): 175.20
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

SAMPLE COLLECTION:

Thimble No. ______ Tare Wt (g) ______
Filter No. ______ Tare Wt (g) ______

COMMENTS & NOTES:

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: AEP
Plant: Conesville, OH
Test Location: Unit 6 FGD outlet

Test Method: OH
Test Run No. 2
Date: 3/17/06
Traverse Sheet 1 of 1

Port-Point No.	Clock Time	Velocity Head (□P) in. H_2O	,210 Orifice (□H) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. □P	,284 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	1320	2.1	,44	41,868	1.449	,411	2.057	—	122	230	242	45	51	50	4
2	1325	2,4	,50	43,93	1.549	,439	2.199	43,925	123	245	270	46	53	51	4
	1330			46,131				46.129							
2-1	1331	2,4	,50	46,131	1,549	,439	2,199	—	122	255	271	45	54	51	4
2	1336	2,4	,50	48,37	1,549	,439	2,199	48,330	127	253	272	47	56	51	4
	1341			50,562				50,569							
3-1	1342	2.6	,55	50,562	1,612	,457	2,289	—	127	256	270	47	57	52	4
2	1347	2.6	.55	52,86	1,612	.457	2,289	52,851	128	259	270	49	58	52	4
	1352			55,152				55,149							
4-1	1353	2,7	,56	55,152	1,643	,467	2,333	—	129	259	270	49	57	52	4
2	1358	2,7	,56	57,49	1,643	,467	2,333	57.485	129	261	270	59	53	51	
	1403			59,823				59,823							
5-1	1419	2,5	,52	59.823	1,643	,467	2,333	—	120	256	272	44	55	53	4
2	1424	2,5	,52	62,19	1,643	,467	2,333	62,156	120	263	270	44	56	53	4
	1429			64,53				64,523							
6-1	1430	3.0	,63	64,53	1,732	,491	2.459	—	119	260	270	42	56	53	4
2	1435	3,0	,63	66,99	1,732	,491	2,459	66.989	121	256	270	44	57	53	4
	1440			69,453				69,449							
7-1	1441	3,0	,63	69,453	1,732	.491	2,459	—	121	257	271	43	56	53	4
2	1446	3,0	.63	71,96	1,732	,491	2,459	71.912	121	253	269	44	56	53	4
	1451			74,425				74,419							
8-1	1452	3,0	,63	74,425	1,732	,491	2,459	—	121	259	270	43	55	52	4
2	1457	3,0	,63	76,89	1,732	,491	2,459	76,884	121	259	270	43	55	52	4
	1502			79,346				79,339							

TEST SUPPORT DATA

TEST PARAMETERS:

Test Run No. 3 Run Date: 3/17/08

Company: AEP
Plant: Conesville, OH
Test Location: Unit 6 FGD outlet
Source Condition: Normal
Test Engineer: JZH
Temp ID: Cm10
Meter ID: cm10
Meter Calibration Factor: 1.003
Pitot ID: 0005A
Pitot Tube Coefficient: .840
Probe Length (ft.): 10'
Probe Liner Material: Pyrex
Nozzle Diameter (in.): .135
Train Setup (select):

Duct Shape (select): Rectangular or Round
Length (ft): 26 Diameter (ft): ____
Width (ft): 20
Duct Area (Sq. Ft.): 520
Disturbance (in diameters) Upstream ____ Downstream ____
Sample Plane (select): Horizontal or Vertical
Port Length (in.):
Port Size (diameter in.): 4"
Port Type: ~~#~~ Nipple
Number of Ports Sampled: 8
Number of Points per Port: 2
Minutes per Point: 5
Total Number of Traverse Points: 16
Test Length (min): 80

STACK CONDITIONS:

Barometric Pressure (in. Hg): 29.23
Static Pressure (in. H_2O): 1'
Flue Pressure (in. Hg Abs):
Sample Train Leak Check: Pre: ____ Post: ____ @ ____ in. Hg
Pitot Leak Check: Pre ✓ Post ✓
Carbon Dioxide (%): 12
Oxygen (%): 7
Gas Values by (select one): Method 3 Orsat/Fyrite Method 3A (analyzer)
Fuel Type Firing (Select): 9780 -Bituminous Coal 9860 - Lignite Coal
10100 - Anthracite Coal 9190 -Fuel Oil 8710 -Natural Gas Other - ____

MOISTURE DETERMINATION:

Impinger Final Wt (mL): ____ Silica Final Wt (g): ____
Impinger Initial Wt (mL): ____ Silica Initial Wt (g): ____
Impinger Wt Gain (mL): ____ Silica Wt Gain (g): ____
Total Water Gain (mL/g): 72.8
Description of Impinger H_2O:
Silica Gel Exhausted?:
Impingers Recovered by:
Silica Gel Weighed by:
Sample Removed from Site by:

SAMPLE COLLECTION:

Thimble No. ____ Tare Wt (g) ____
Filter No. ____ Tare Wt (g) ____

COMMENTS & NOTES:

FIELD TEST DATA SHEET - ISOKINETIC SAMPLING

Company: AEP
Plant: Conesville, OH
Test Location: Unit 6 FGD outlet

Test Method: OH
Test Run No. 3
Date: 3/17/06
Traverse Sheet 1 of 1

Port-Point No.	Clock Time	Velocity Head (□P) in. H_2O	.210 Orifice (□H) in. H_2O	Actual Meter Volume (V_m) ft^3	Sqrt. □P	.284 Meter Rate cfm	Theoretical Meter Volume per Point (V_m) ft^3	Theoretical Meter Volume (V_m) ft^3	Stack Temp (t_s) °F	Probe Temp. °F	Filter Holder Temp. °F	Impinger Outlet Temp. °F	Meter Temp. (t_m) Inlet °F	Meter Temp. (t_m) Outlet °F	Pump Vacuum in. Hg
1-1	1525	2.6	.54	79.622	1.612	.457	2.289	—	119	230	254	40	51	50	2
2	1530	2.6	.54	81.94	1.612	.457	2.289	81.911	121	230	271	38	52	50	2
	1535			84.248				84.229							
2-1	1536	2.6	.54	84.248	1.612	.457	2.289	—	121	242	271	40	52	50	2
2	1541	2.6	.54	86.54	1.612	.457	2.289	86.537	119	250	270	39	52	49	2
	1546			88.832				88.829							
3-1	1547	2.6	.54	88.832	1.612	.457	2.289	—	120	252	271	40	51	49	2
2	1552	2.6	.54	91.10	1.612	.457	2.289	91.121	120	251	271	39	53	50	
	1557			93.389				93.389							
4-1	1558	2.6	.54	93.389	1.612	.457	2.289	—	120	255	271	40	52	49	2
2	1603	2.6	.54	95.64	1.612	.457	2.289	95.678	120	255	270	39	52	49	2
	1608			97.931				97.929							
5-1	1616	2.7	.57	97.931	1.643	.467	2.333		125	249	274	40	50	49	3
2	1621	2.7	.57	100.29	1.643	.467	2.333	100.264	125	246	271	38	51	49	3
	1626			102.630				102.623							
6-1	1627	2.7	.57	102.630	1.643	.467	2.333	—	125	256	270	40	50	49	3
2	1632	2.7	.57	104.93	1.643	.467	2.333	104.963	124	255	268	39	52	48	3
	1637			107.284				107.203							
7-1	1638	2.7	.57	107.284	1.643	.467	2.338	—	126	251	270	40	52	49	3
2	1643	2.7	.57	109.60	1.643	.467	2.338	109.617	126	251	270	41	52	48	3
	1648			111.982				111.938							
8-1	1649	2.5	.53	111.992	1.581	.332	2.245		128	259	270	39	52	48	3
2	1654	2.5	.53	114.22	1.581	.332	2.245	114.237	128	259	270	39	52	48	3
	1659							116.463							

CCS #1

Method 8A - Determination of Sulfuric Acid Vapor or Mist and Sulfur Dioxide Emissions

ADA-AEP-CONESVILLE

Source UNIT 6 ESP INLET

Date 3-16-05

Run No. #1 (CCS)

Furnace Load NORMAL

Stack Gas Temp. 330.

Atmospheric Pressure 29.00

Final Dry Gas Meter Reading 98.597

Initial Dry Gas Meter Reading 77.536

Volume Sampled 21.061 ft³

Time (min)	Temperature, °F					Meter Volume
	Probe	Filter	Condenser	Dry Gas Meter In	Dry Gas Meter Out	
1500	500	500	178	81	80	77.536
1505	500	501	174	81	80	79.286
1510	499	499	172	81	80	81.042
1515	500	501	171	83	81	82.797
1520	499	499	172	84	81	84.545
1525	500	500	174	85	81	86.295
1530	500	500	175	85	82	88.058
1535	500	499	175	85	82	89.799
1540	500	501	175	85	82	91.538
1545	499	500	174	85	82	93.294
1550	500	501	174	85	82	95.138
1555	500	501	174	85	82	96.802
1600						98.597

82.5

542.5

Figure 4. SO_3 Measurement Field Data Sheet

232 mils TOTAL (POST TEST)
32 GAIN

20.001 VMSTD

1.51 VWSTD

0.070 BWS

CCS #2

Method 8A - Determination of Sulfuric Acid Vapor or Mist and Sulfur Dioxide Emissions

ADA - AEP CONESVILLE

Source UNIT 6 ESP INLET

Date 3-16-06

Run No. #2 (CCS)

Furnace Load NORMAL

Stack Gas Temp. 330°F

Atmospheric Pressure 29.00

Final Dry Gas Meter Reading 120.151

Initial Dry Gas Meter Reading 98.689

Volume Sampled 21.462

Time (min)	Temperature, °F					Meter Volume
	Probe	Filter	Condenser	Dry Gas Meter In	Dry Gas Meter Out	
1625	500	499	176	83	82	98.689
1630	500	501	182	84	82	100.456
1635	500	501	180	84	82	102.22
1640	500	500	180	85	82	103.952
1645	500	500	182	85	82	105.70
1650	500	500	179	85	82	107.446
1655	499	499	177	86	83	109.193
1700	500	501	176	86	83	110.943
1705	499	499	176	86	83	112.73
1710	500	500	177	86	83	114.54
1715	500	500	178	86	83	116.32
1720	500	500	178	86	83	118.09
1725						120.151

Figure 4. SO_3 Measurement Field Data Sheet

83.83

20.333 VMSTD

234 mls TOTAL
34 GAIN

CCS #3

ADA - AEP CONESVILLE

Source UNIT 6 ESP INLET

Date 3-16-06

Run No. #3 (CCS)

Furnace Load NORMAL

Stack Gas Temp. 330 °F

Atmospheric Pressure 29.00

Final Dry Gas Meter Reading 141.723

Initial Dry Gas Meter Reading 120.162

Volume Sampled 21.561

Time (min)	Temperature, °F Probe	Filter	Condenser	Dry Gas Meter In	Out	Meter Volume
1745	500	501	173	83	82	120.162
1750	499	500	175	85	83	122.06
1755	499	500	176	86	83	123.89
1800	501	501	176	86	83	125.72
1805	500	500	177	86	83	127.49
1810	500	500	177	87	83	129.15
1815	501	501	176	87	83	130.99
1820	500	500	176	87	83	132.89
1825	501	501	175	87	83	134.63
1830	500	499	175	87	83	136.39
1835	500	501	175	87	83	138.15
1840	500	501	170	87	83	139.89
1845						141.723

84.58

Figure 4. SO_3 Measurement Field Data Sheet

.238

230 mils TOTAL
30 gain

Source unit #6 ESP outlet

Date 3/16/06

Run No. 1

Furnace Load Normal

Stack Gas Temp. ≈339

Atmospheric Pressure 29.10

.353/m

Final Dry Gas Meter Reading 79.182

Final mls gained = 31

Initial Dry Gas Meter Reading 57.951

Volume Sampled 21.229

Start time 1500 Time (min)	Temperature, °F					Meter Volume
	Probe	Filter	Condenser	Dry Gas Meter In	Dry Gas Meter Out	
1500	385	500	180	64	63	57.951
0 1505	483	512	179	64	63	59.64
1510	500	499	176	65	63	61.41
5 1515	500	505	176	65	63	63.18
1520	500	498	176	65	63	64.98
10 1525	500	500	178	66	63	66.77
1530	500	503	178	66	63	68.55
1535	500	498	178	66	63	70.33
15 1540	501	503	178	66	63	72.13
1545	500	500	177	66	63	73.92
20 1550	500	502	178	66	63	75.67
1555	499	500	178	66	63	77.42
25 1600						79.18
30						

Figure 4. SO_3 Measurement Field Data Sheet

Source Unit 6 ESP outlet

Date 3/16/06

Run No. 2

Furnace Load Normal

Stack Gas Temp. ≈339

Atmospheric Pressure 29.10

Final Dry Gas Meter Reading 100.290

Total ml's gained 41

Initial Dry Gas Meter Reading 79.293

Volume Sampled 20.997

Time (min)	Temperature, °F Probe	Filter	Condenser	Dry Gas Meter In	Dry Gas Meter Out	Meter Volume
1625	371	498	177	63	62	79.293
0 1630	439	506	177	63	63	81.06
1635	502	501	178	64	62	82.83
5 1640	500	501	178	65	62	84.60
1645	500	500	177	65	62	86.25
10 1650	500	500	177	66	63	88.02
1655	500	500	177	65	63	89.79
15 1700	500	500	177	67	63	91.54
1705	500	500	177	67	63	93.28
20 1710	500	500	177	67	63	95.03
25 1715	500	500	177	67	63	96.79
1720	500	500	176	67	63	98.52
30 1725						100.290

Figure 4. SO_3 Measurement Field Data Sheet

Source Unit 6 ESP outlet

Date 3/16/06

Run No. 2

Furnace Load Normal

Stack Gas Temp. ≈ 329

Atmospheric Pressure 29.10

Final Dry Gas Meter Reading 21.310

Final mls 36

Initial Dry Gas Meter Reading 0.324

Volume Sampled 20.981

Time (min)	Temperature, °F					meter Volume
	Probe	Filter	Condenser	Dry Gas Meter In	Dry Gas Meter Out	
1745	381	408	178	63	62	0.324
0 1750	451	492	176	64	62	2.07
1755	503	502	174	63	62	3.83
1800	499	501	175	63	61	5.60
10 1805	500	500	176	63	61	7.36
1810	499	500	176	63	61	9.13
15 1815	501	500	176	63	60	10.86
20 1820	500	500	175	63	60	12.59
1825	501	500	176	63	60	14.32
25 1830	499	500	176	63	60	16.05
1835	500	500	177	64	60	17.80
30 1840	498	500	177	64	60	19.54
1845						21.310

Figure 4. SO_3 Measurement Field Data Sheet

APPENDIX H: CFD Model Report

REACTION
ENGINEERING
INTERNATIONAL

CFD Modeling of Activated Carbon Injection for Mercury Control in Coal-Fired Power Plants

Electric Power Conference
May 2-4, 2006

Marc Cremer, Constance Senior, Martin Denison, Steven Hardy

Reaction Engineering International
77 W. 200 S., Suite 210, Salt Lake City, UT 84101

ELECTRIC POWER 2006

ASME POWER

Mercury Control Technology Strategies

- Increase natural Hg capture
  - Combustion modifications
  - Burn coal blends
  - Use additives or catalysts
- Use of sorbents
  - Activated carbon injection demonstrated at multiple utility boilers
  - Other sorbents (doped activated carbon, non-carbon sorbents) undergoing testing
- Wet scrubbers
- Multipollutant control methods

Modeling Sorbent Injection

- ☑ Duct geometry and flow characteristics
- ☑ Injector design
- ☑ Sorbent properties
- ☑ CFD model:
  - Two-phase, chemically reacting flow
  - Iterate gas composition (Hg species) with sorbent particle trajectories

Modeling Sorbent Injection

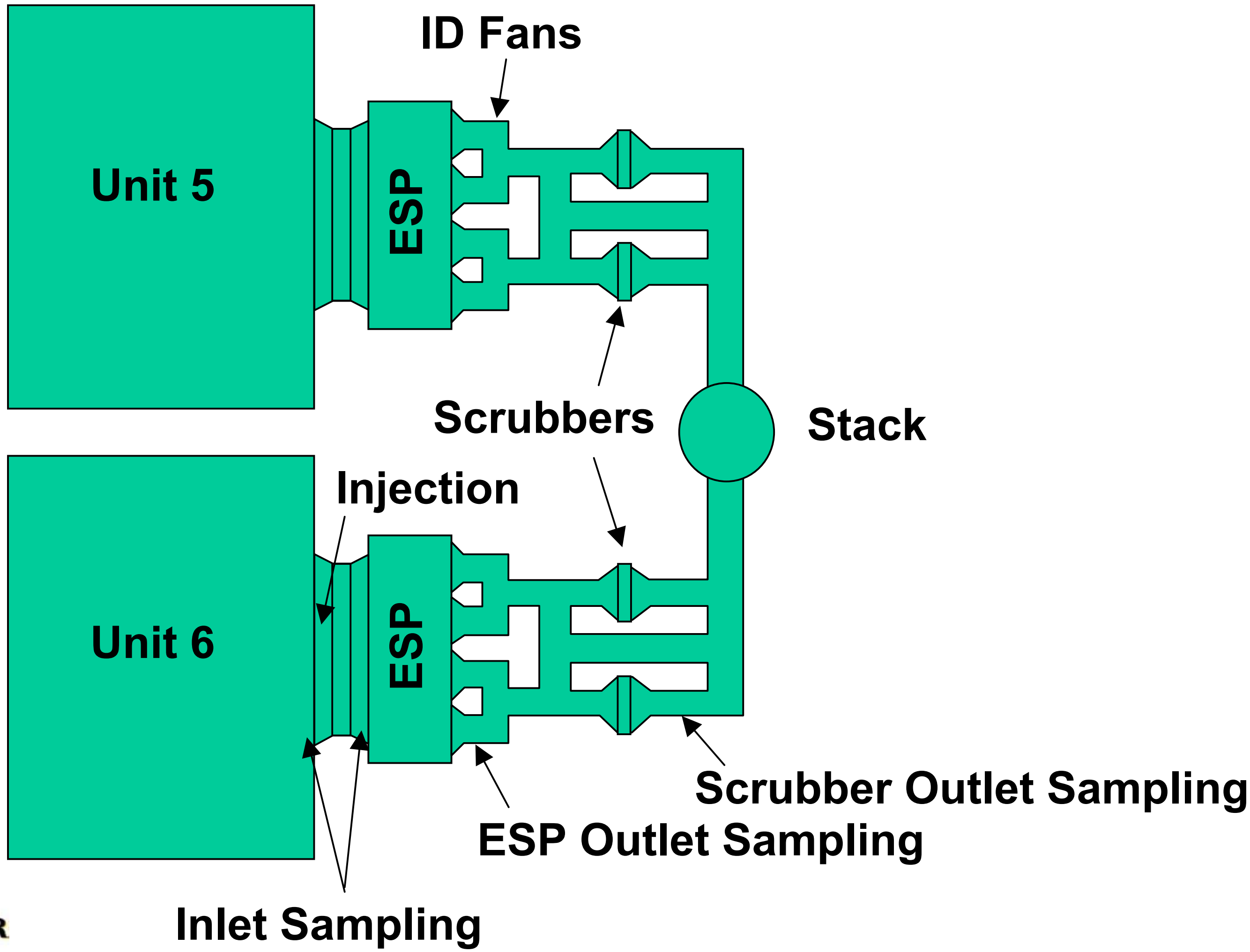
- Injector Design:
  - Sorbent loading in flue gas
  - Sorbent particle residence time
- Performance Assessment:
  - Mercury concentration in gas and sorbent

Sorbent Injection Demonstration at Conesville

- AEP's Conesville, Unit 6, Conesville, OH
- 400 MW boiler firing high-sulfur Ohio Basin coal
  - Inlet Mercury speciation (assumed)
    - 40 vol% Hg^0
    - 60 vol% $HgCl_2$
- Regenerative air heater
- Particulate collection device
  - Cold-side ESP, SCA = 301 ft^2/1000 acfm
- Wet FGD Scrubber

Ultimate Analysis, wt%	
C	62.51
S	3.31
H	4.63
H_2O	8.79
N	1.23
O	7.05
Ash	12.50
Total	100.02
Trace elements, ug/g dry	
Hg	0.381
Cl	275
Fuel heating value, BTU/lb	11,020

Conesville Overall Layout



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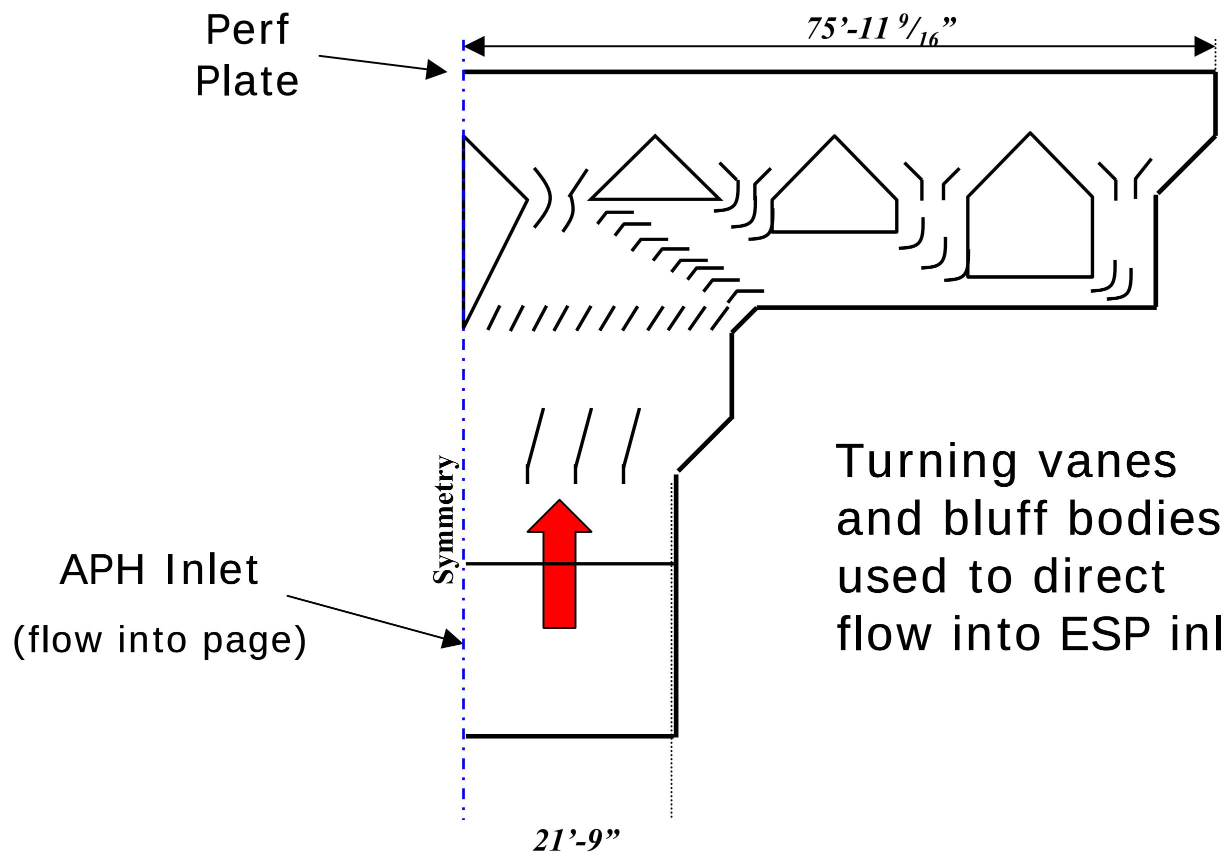
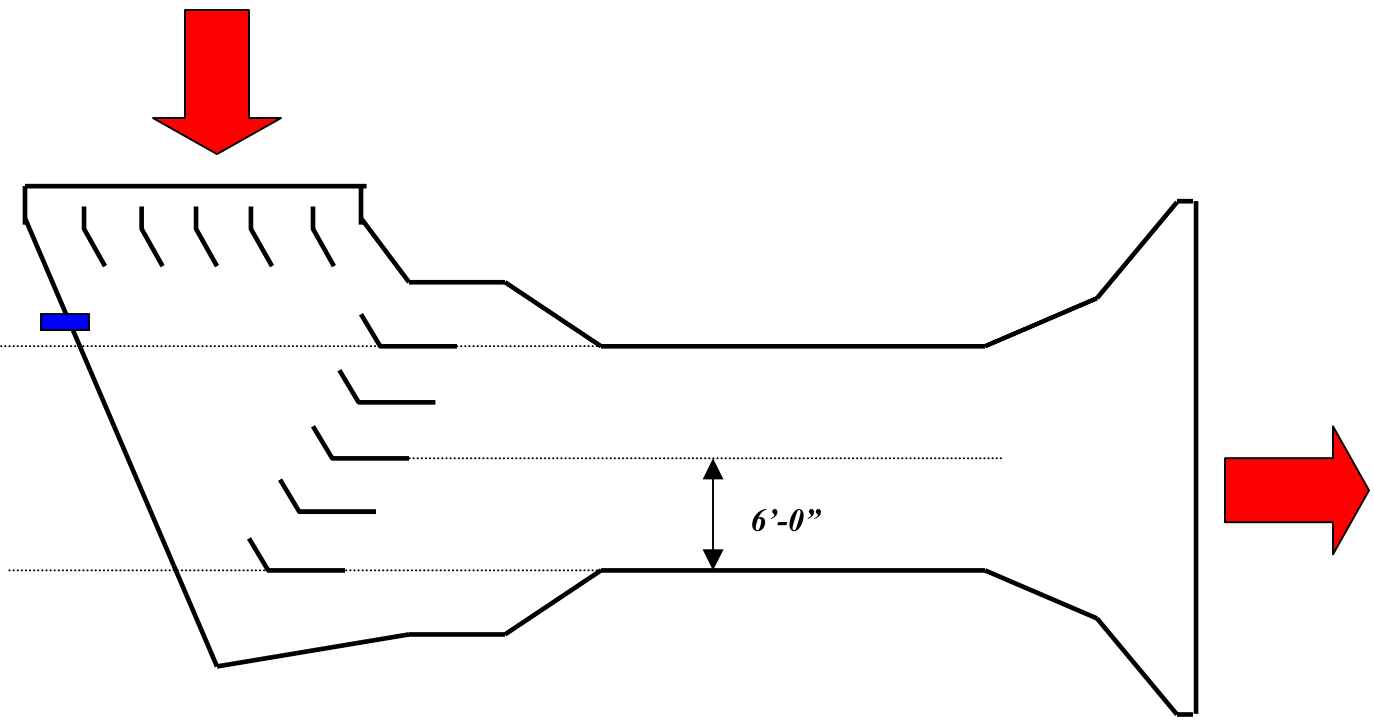
Duct Geometry – Plan View



Turning vanes and bluff bodies used to direct flow into ESP inlet

Duct Geometry – Elevation View



Elevation of sorbent injection lances

Turning vanes extend the full width of the duct

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Drawings Not to Scale

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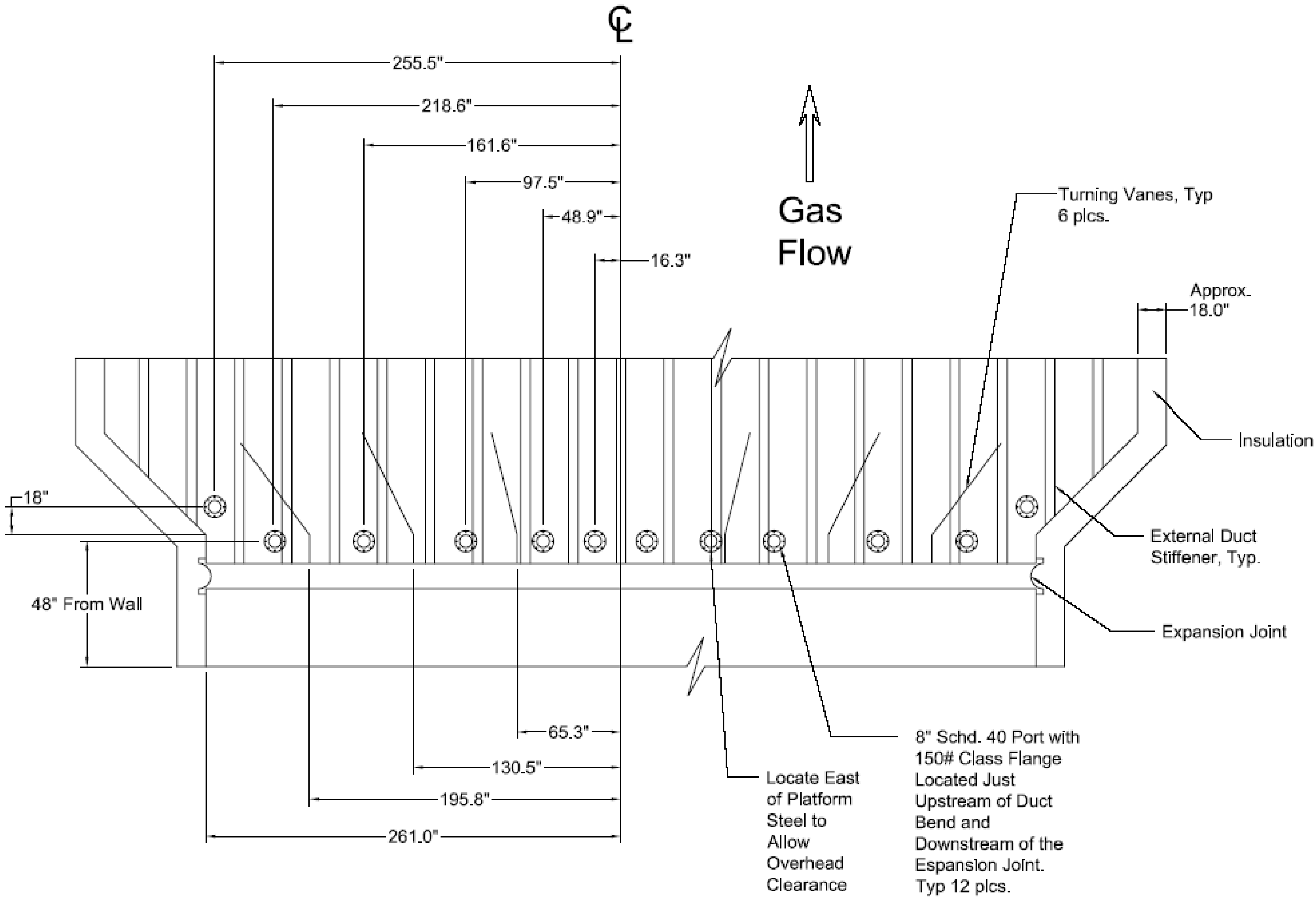
Injection Lance Array Plan View



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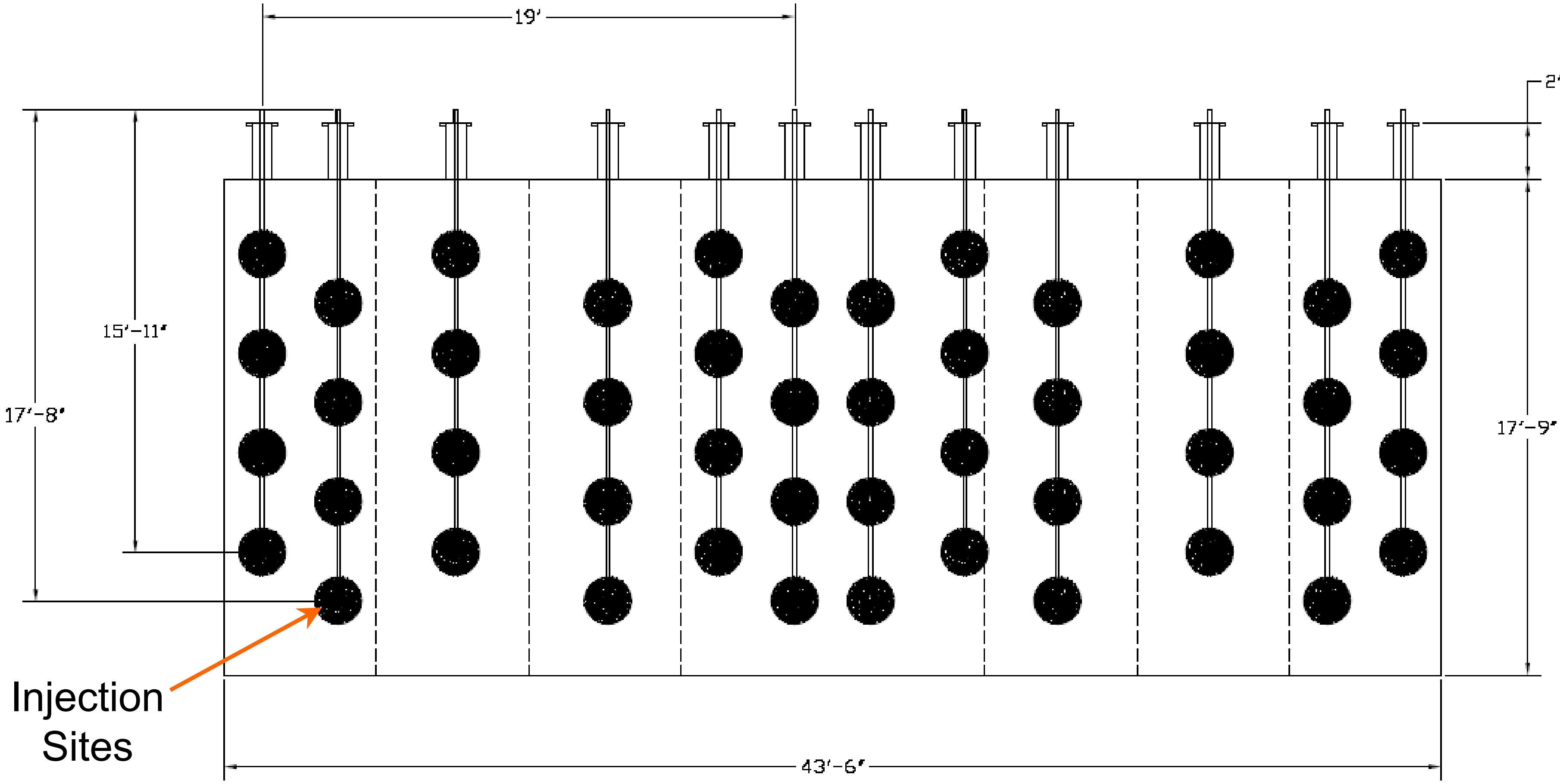
Injection Lance Array Viewed from Inside the Duct



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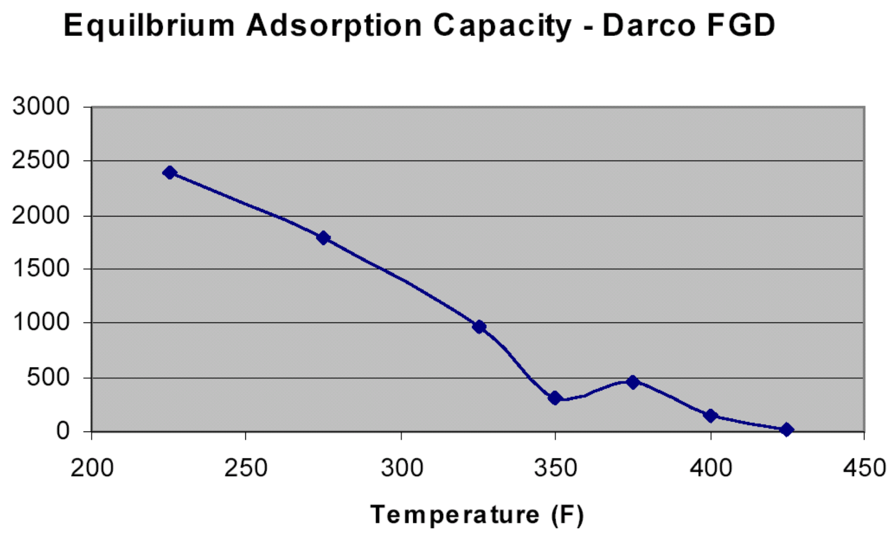
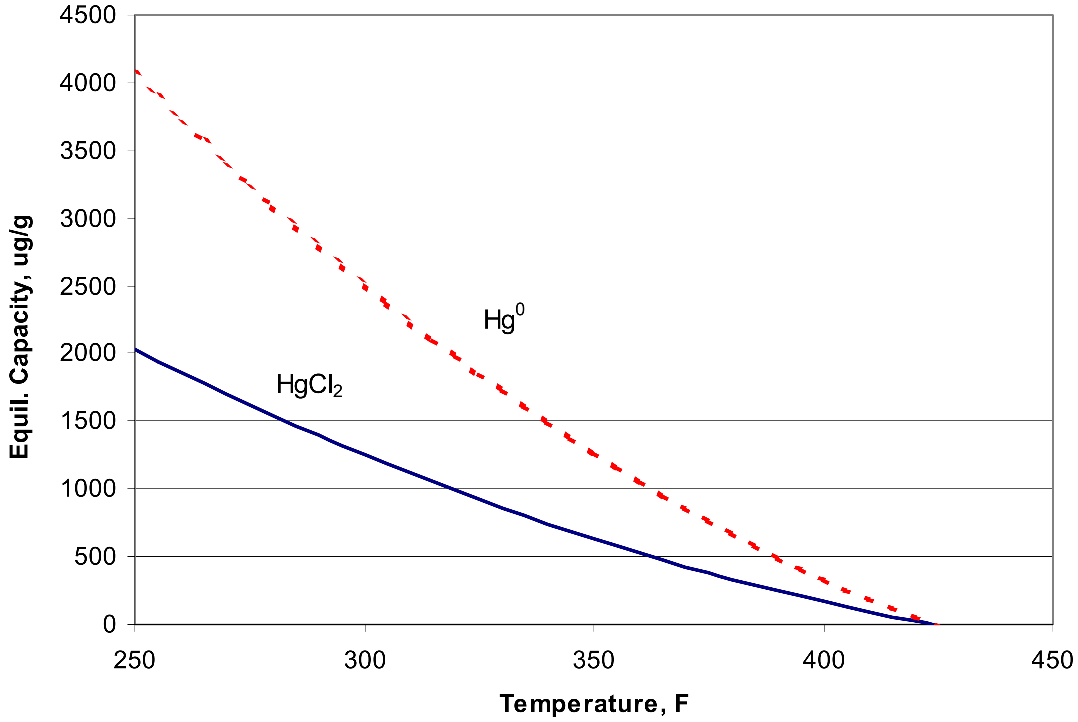
Sorbent Capacity



- Estimate sorbent capacity, based on URS fixed bed data for conditions simulating E. Bituminous flue gas:
  - 1600 ppm SO_2; 50 ppm HCl; 400 ppm NO_x; 12% CO_2; 7% H_2O; 6% O_2
  - No SO_3

- Equilibrium capacity results are µg Hg/g sorbent normalized to 50 $\mu g/Nm^3$
- Hg in simulated flue gas was >95% $HgCl_2$ for all tests

Inputs to Model: Sorbent Capacity

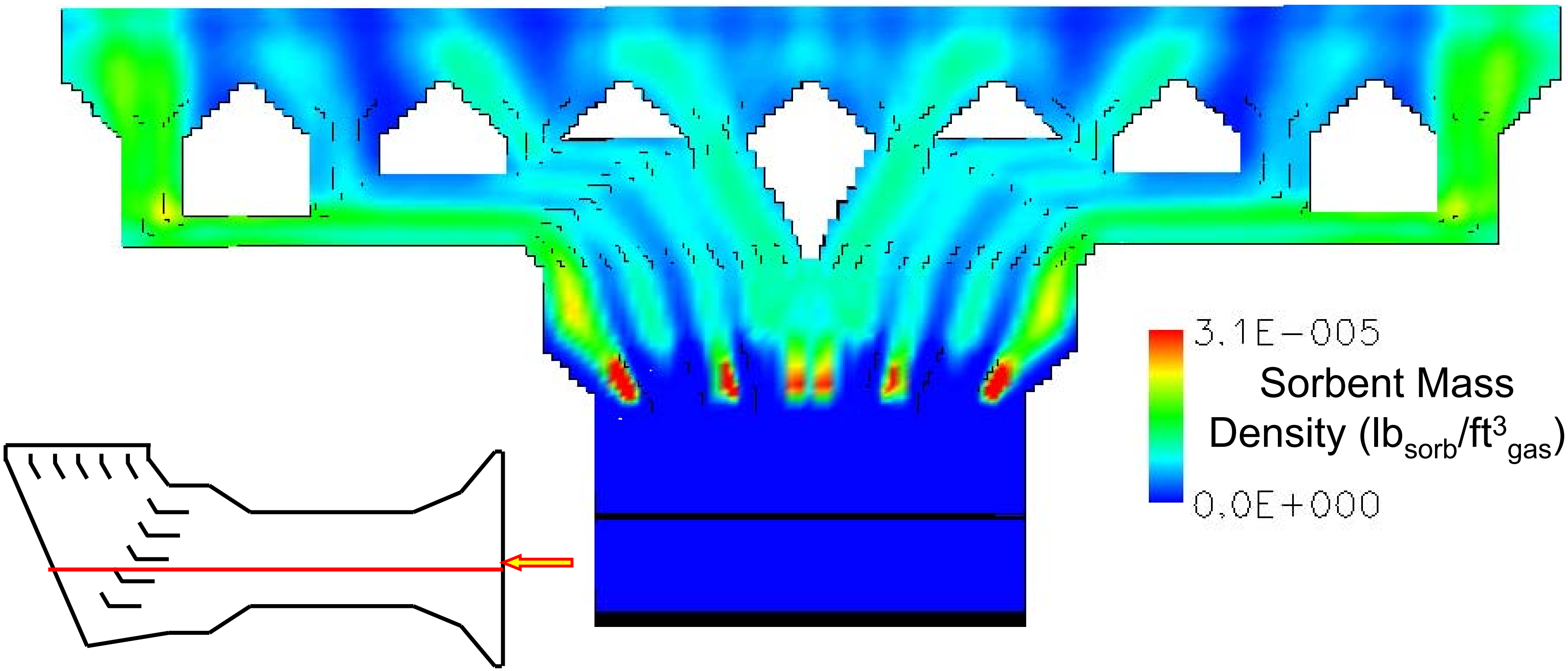


- Fit URS capacity data for $HgCl_2$
- Assume Hg^0 capacity is twice $HgCl_2$ capacity
- Use Freundlich isotherm to model sorption of mercury species

1. BASELINE CASE

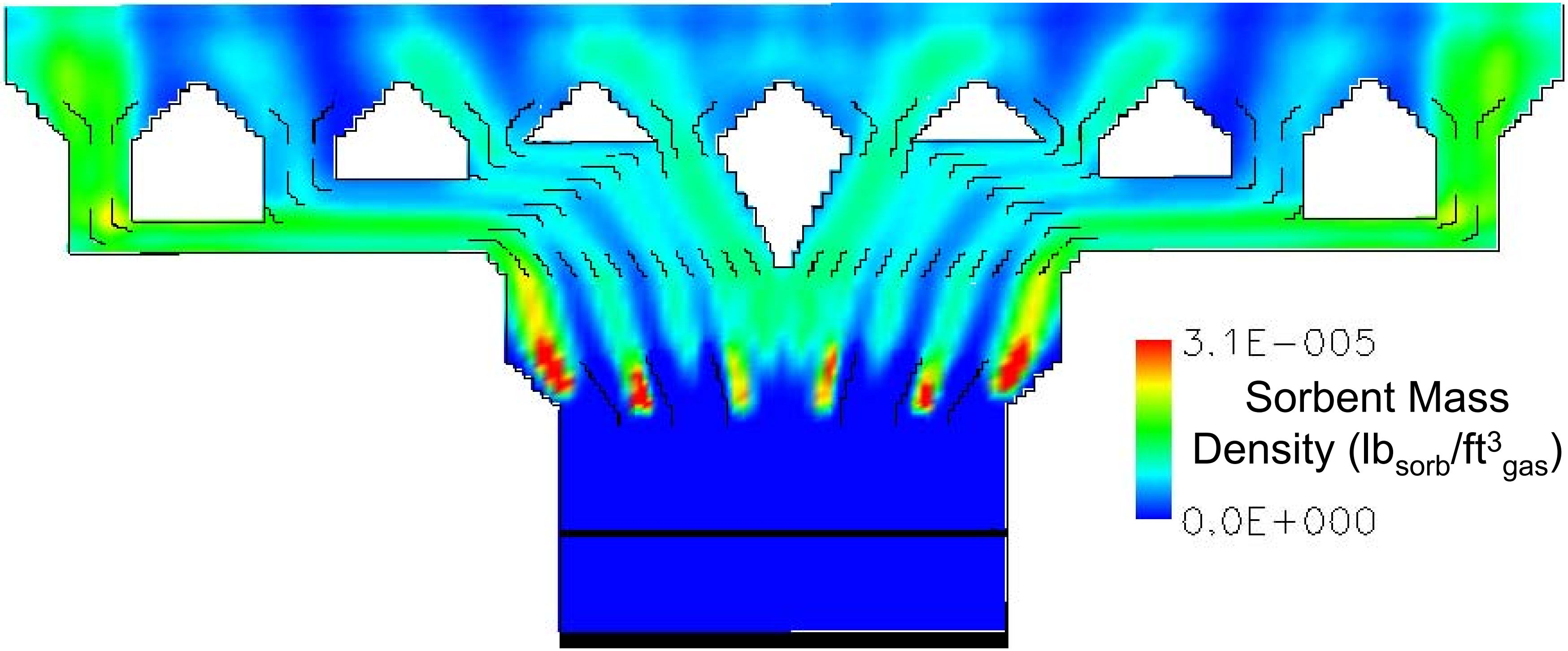
- Non-Isothermal Inlet Temperature Ranges from 325°F to 375°F (West to East)
- Uniform mass flux at the APH exit (model inlet)
- 9.95 lb/MMacf sorbent injected

Baseline Sorbent Mass Density

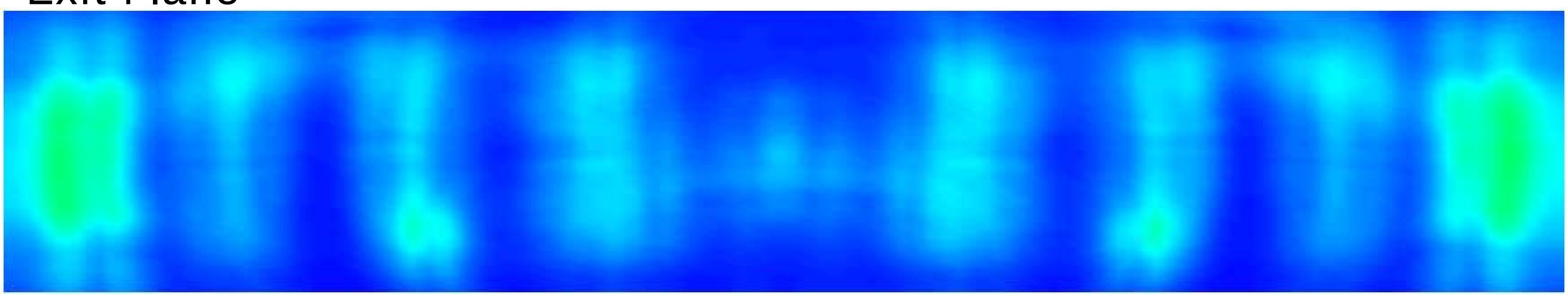


- Two outermost lances produce high sorbent concentration in outer sections of flue gas

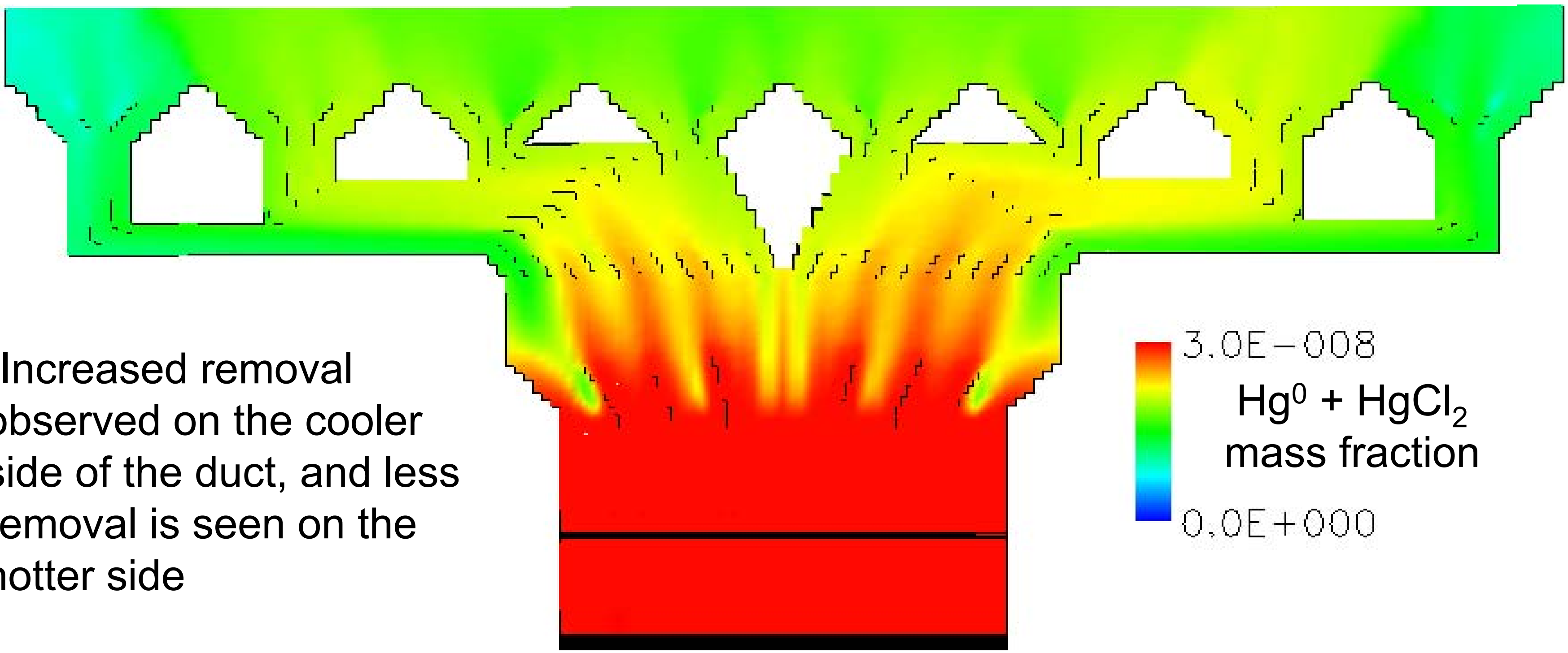
Baseline Sorbent Mass Density



Exit Plane

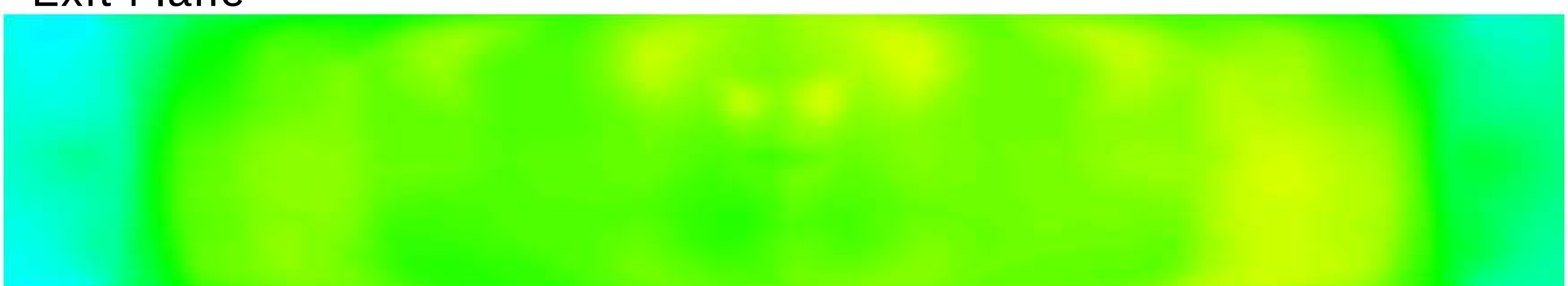


Baseline Hg^0 + $HgCl_2$ Concentration

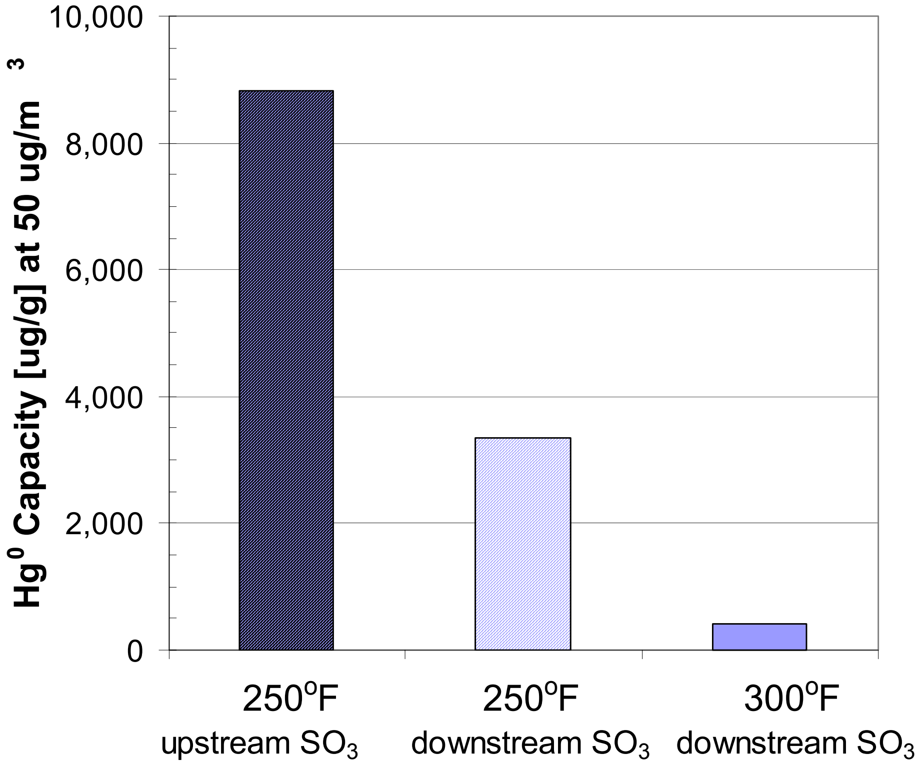


•Increased removal observed on the cooler side of the duct, and less removal is seen on the hotter side

Exit Plane



Equilibrium Capacity for Hg^0



- Capacity decreases with increases in
  - SO_3
  - Temperature

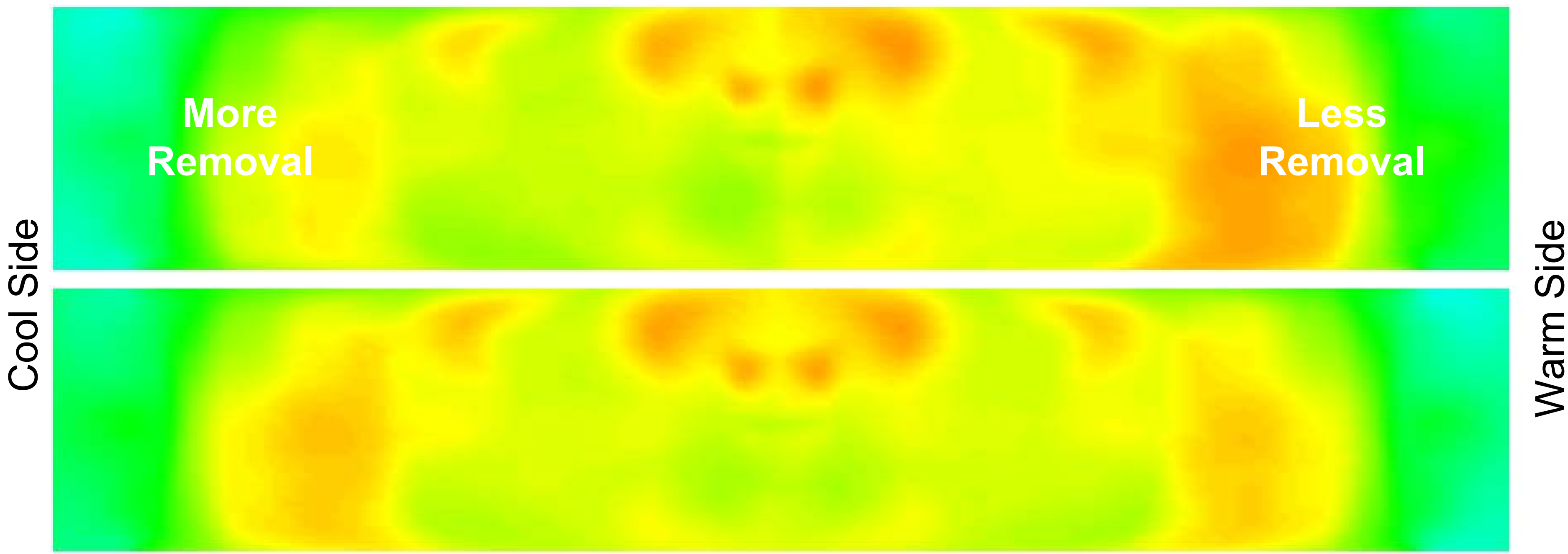
Fixed bed data, Darco Hg, in PRB flue gas at Pleasant Prairie

2. ISOTHERMAL CASE

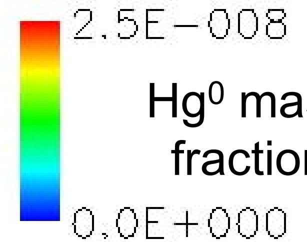
- Isothermal inlet temperature 350°F
- Uniform mass flux at the APH exit (model inlet)
- 9.95 lb/MMacf sorbent injected

$Hg^0 + HgCl_2$ Concentration (exit plane)

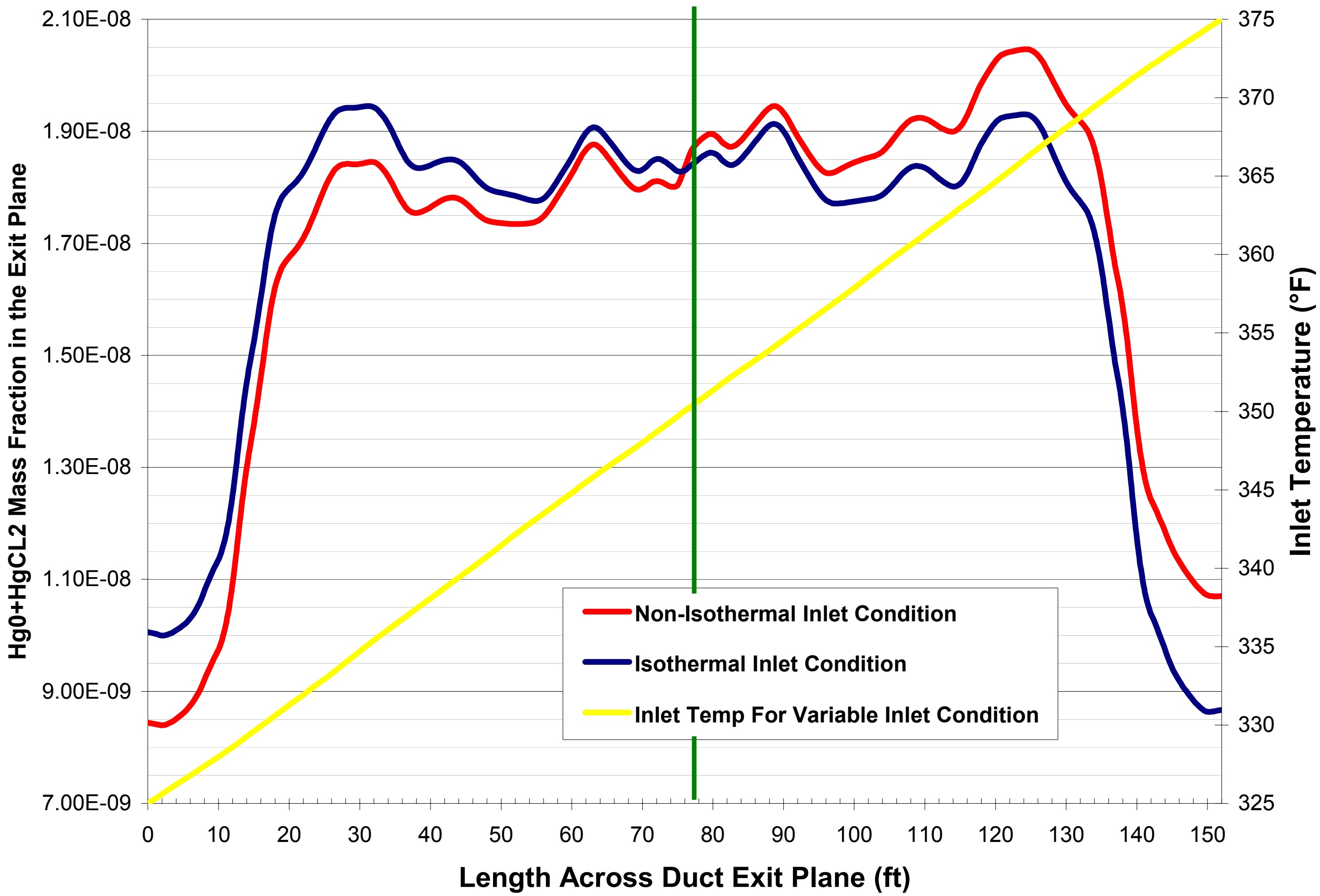
Non-Isothermal Inlet Condition, 44% total removal



Isothermal Inlet Temperature, 45% total removal



$Hg^0 + HgCl_2$ Concentration (exit plane, weighted average)



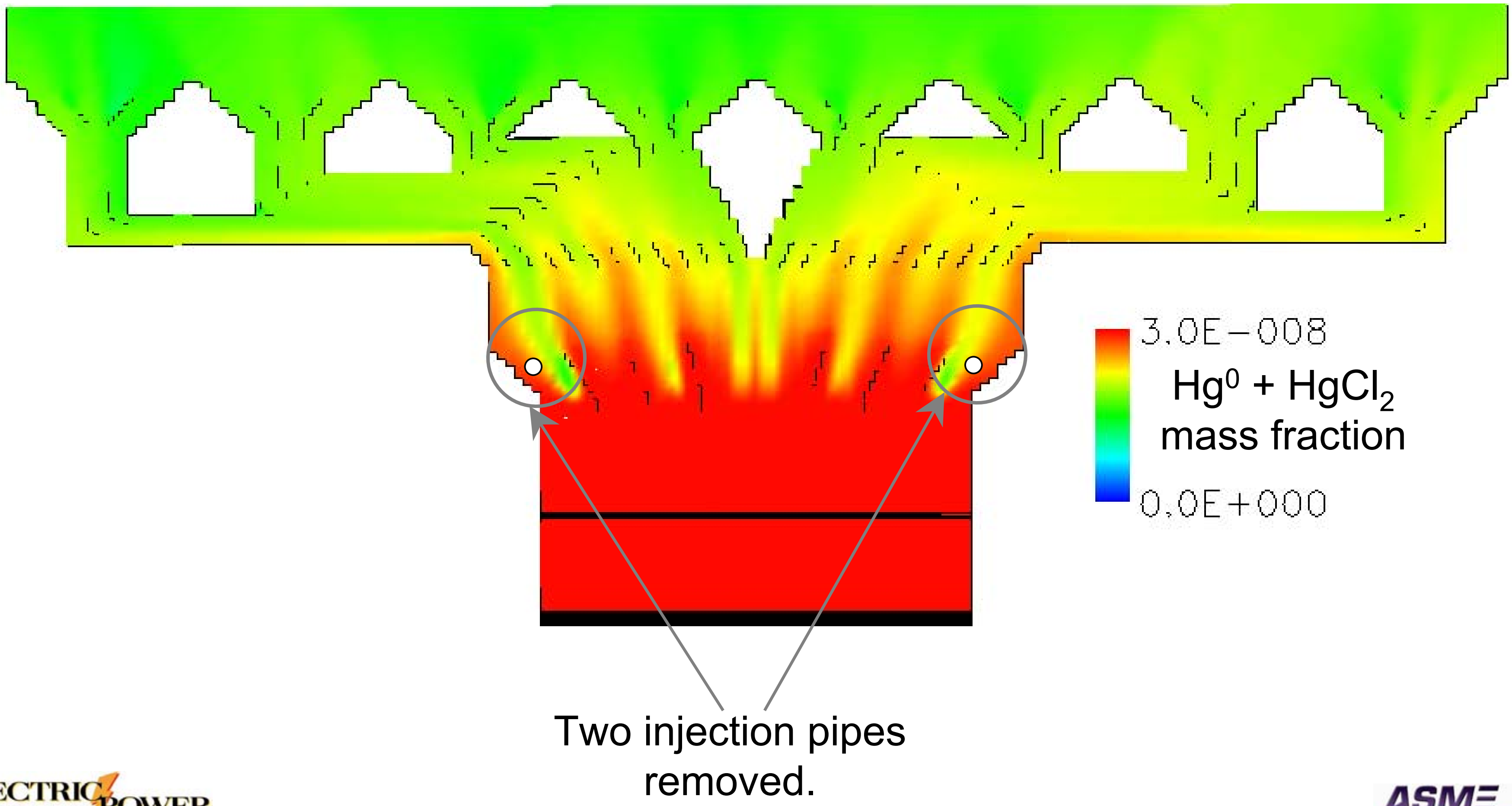
Effect of Temperature Variation

- Temperature variation across the duct (325^oF to 375^oF) changes average exit Hg concentration across the duct, relative to the isothermal (350^oF) case
- Temperature variation does not affect the overall Hg reduction
- Variation with temperature depends on assumed variation in Hg adsorption isotherms with temperature

3. REDUCED LANCES CASE

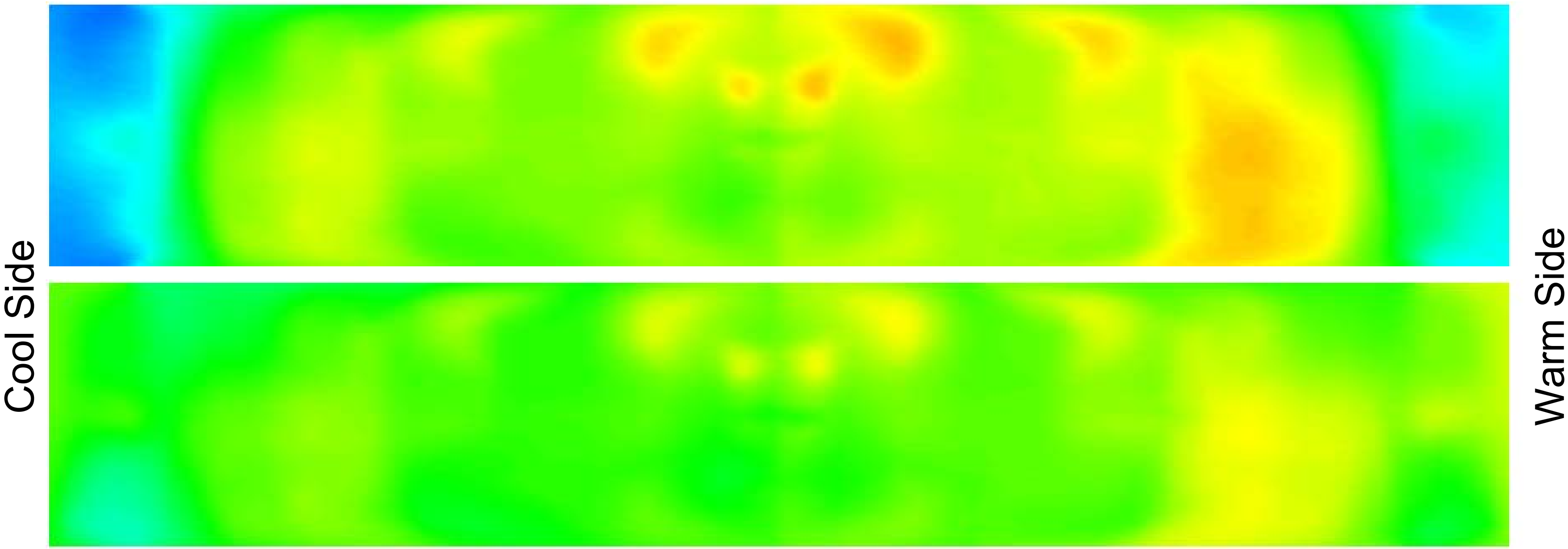
- 10 vs. 12 injection lances
- Non-isothermal inlet temperature profile
- 9.95 lb/MMacf sorbent injected

Reduced Lances
Hg^0 + $HgCl_2$ Concentration

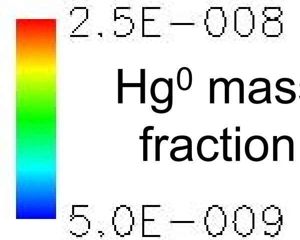


$Hg^0 + HgCl_2$ Concentration (exit plane)

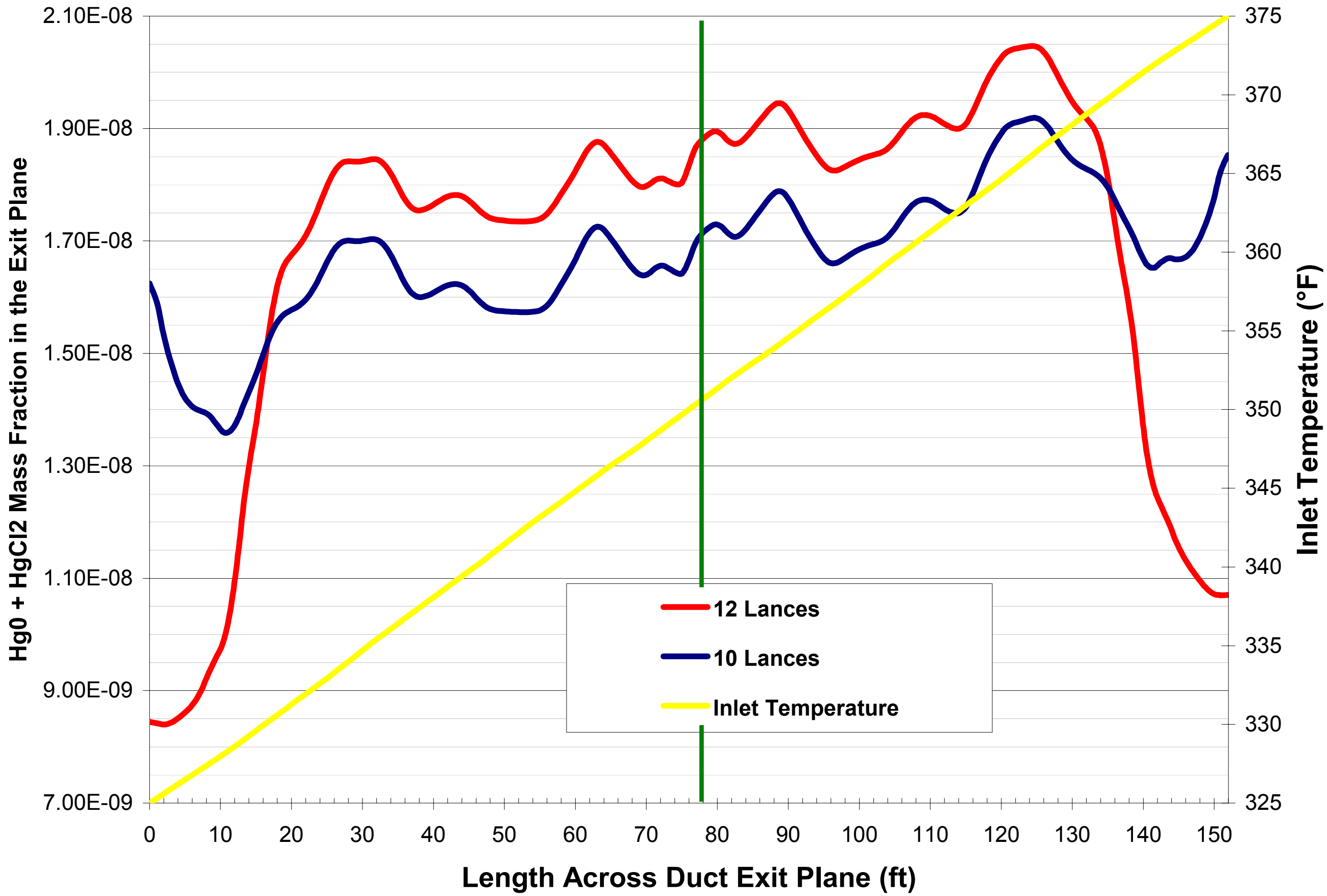
Baseline 12 Lance Injection, 44% total removal



No Outer Lances (10 lances), 45% total removal



$Hg^0 + HgCl_2$ Concentration (exit plane, weighted average)



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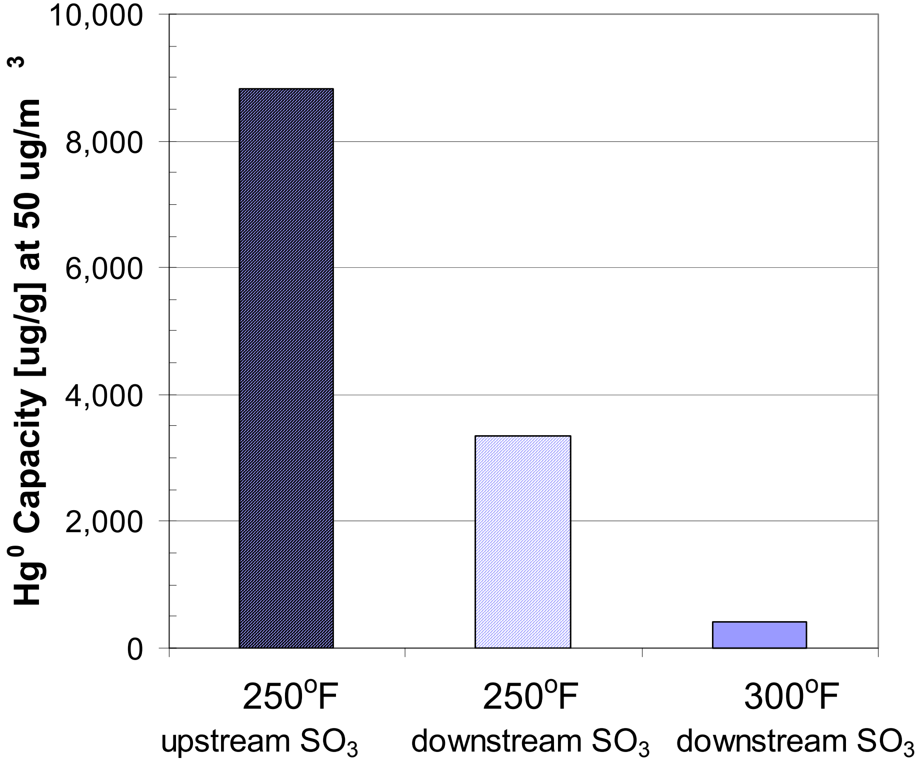
Removal of Outer Lances

- Removing outer lances (one on each side) gives a more even distribution of sorbent
  - Hg concentrations at exit in the *middle* of the duct are 10% lower than the 12-lance case
- Temperature variation still results in variation in Hg exit concentration from side to side

Equilibrium Capacity for Hg^0



- Capacity decreases with increases in
  - SO_3
  - Temperature

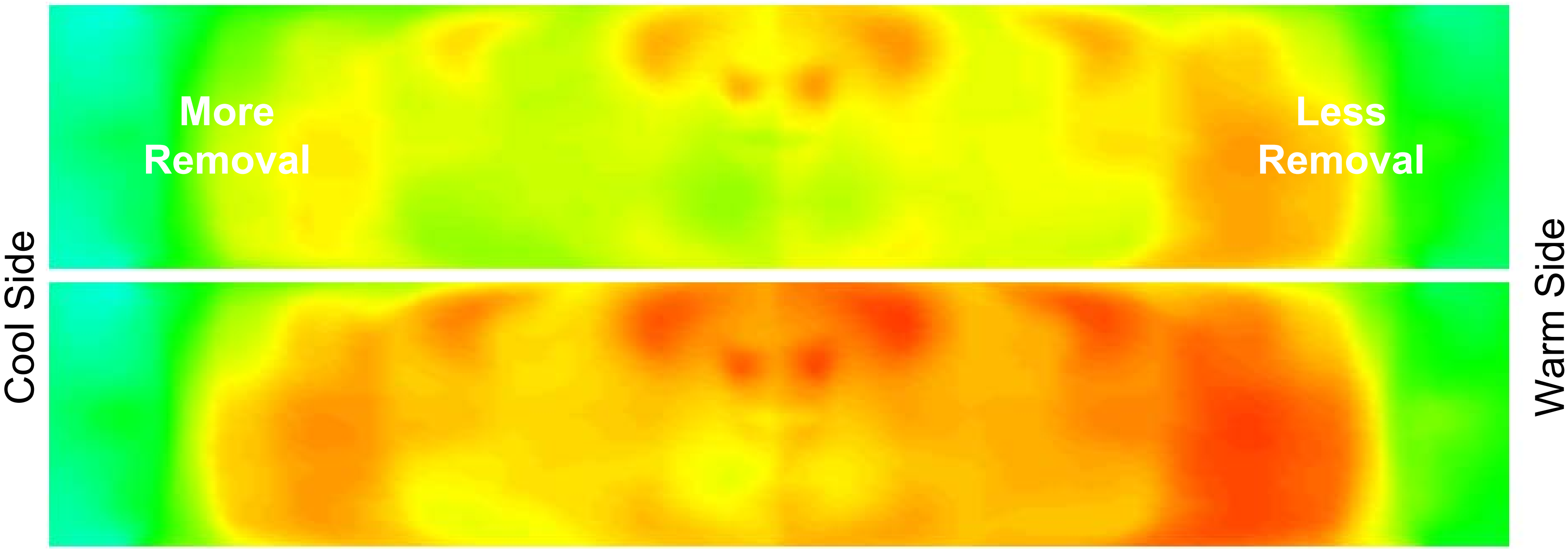
Fixed bed data, Darco Hg, in PRB flue gas at Pleasant Prairie

4. REDUCED SORBENT CAPACITY

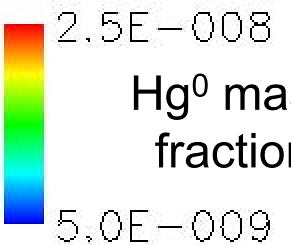
- Non-isothermal inlet temperature
- 12 lances
- Uniform mass flux at the APH exit (model inlet)
- 9.95 lb/MMacf sorbent injected
- Sorbent capacity was reduced in half

$Hg^0 + HgCl_2$ Concentration (exit plane)

Previous Result, 44% total removal

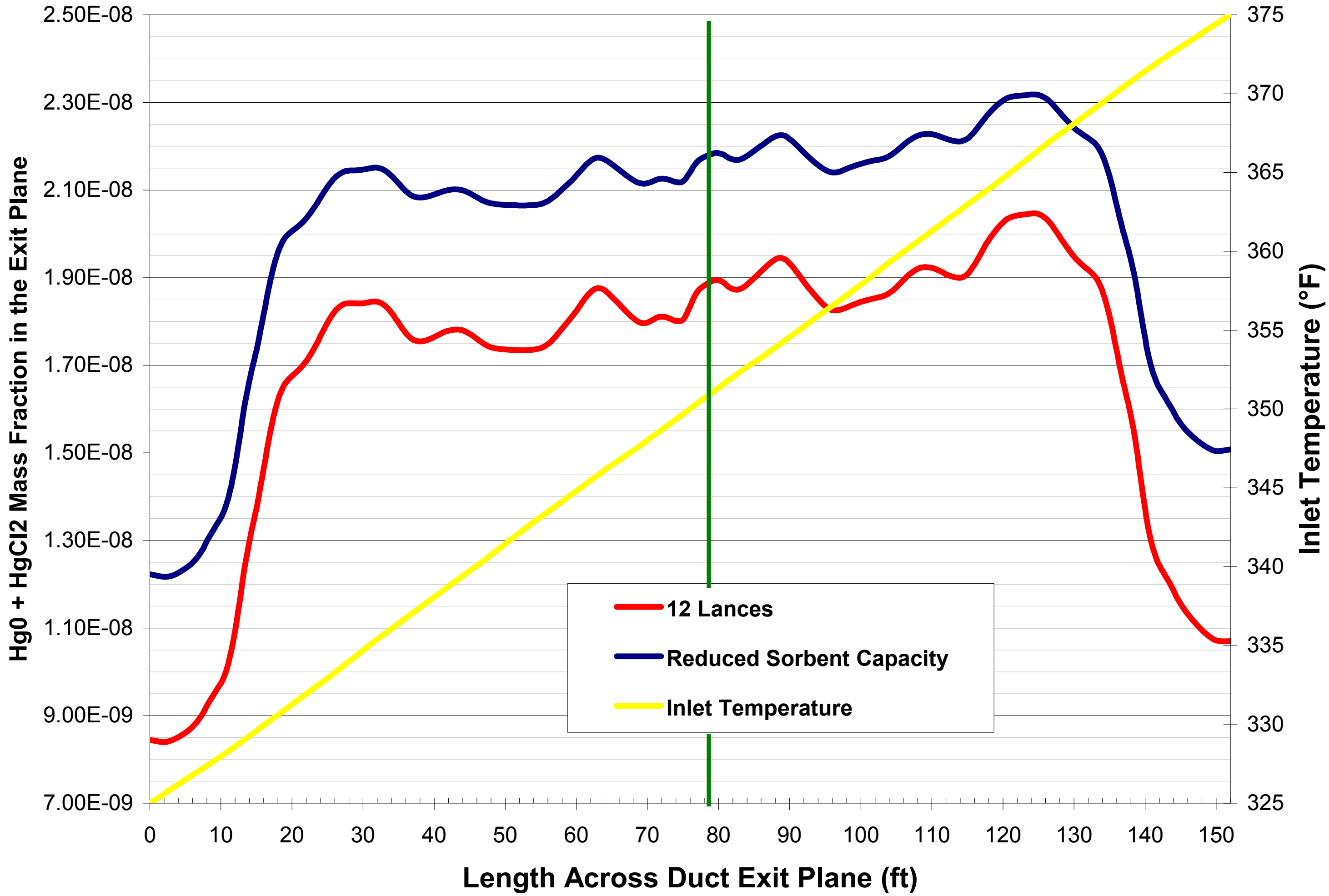


Sorbent Capacity Reduced to Half, 34% total removal



- Increased removal is observed on the cooler side of the duct, and less removal is seen on hotter side

$Hg^0 + HgCl_2$ Concentration (exit plane, weighted average)



Reduced Sorbent Capacity

- Reducing the sorbent capacity by half decreased the amount of Hg removed by 23%
  - If the removal were diffusion-limited, there would have been no change
  - If capacity-limited, the amount removed would have been 50% of that originally modeled
  - The results suggest control is between the two regimes

Conclusions

- Temperature variation across duct (325^{o}F to 375^{o}F) gives variation in exit Hg concentration across the duct, but little change in overall Hg reduction relative to isothermal (350^{o}F) case
- Removing outer lances (10 lances instead of 12) gives a more even distribution of sorbent and Hg removal
  - Hg concentrations at exit in the *middle* of the duct are 10% lower than the 12-lance case
- Cutting sorbent capacity in half, reduces overall Hg removal by 23%

Case	Hg Removal
1. Baseline: 12 lances, 325-375^{o}F	44%
2. Isothermal: 12 lances, 350^{o}F	45%
3. Reduced (10) lances, 325-375^{o}F	45%
4. Reduced sorbent capacity: 12 lances, 325-375^{o}F	34%

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